

FROM SIGNALS TO CYBER:
THE RISE, FALL, AND RESURRECTION OF
THE AIR FORCE COMMUNICATIONS OFFICER

BY
MAJOR JOSEPH R. GOLEMBIEWSKI

A THESIS PRESENTED TO THE FACULTY OF
THE SCHOOL OF ADVANCED AIR AND SPACE STUDIES
FOR COMPLETION OF GRADUATION REQUIREMENTS

SCHOOL OF ADVANCED AIR AND SPACE STUDIES
AIR UNIVERSITY

MAXWELL AIR FORCE BASE, ALABAMA

JUNE 2010

APPROVAL

The undersigned certify that this thesis meets master's-level standards of research, argumentation, and expression.

DR. STEPHEN E. WRIGHT (Date)

LT COL JOHN H. DAVIS (Date)

DISCLAIMER

The conclusions and opinions expressed in this document are those of the author. They do not reflect the official position of the US Government, Department of Defense, the United States Air Force, or Air University.

ABOUT THE AUTHOR

Major Joseph R. Golembiewski is a cyberspace operations officer currently attending the School of Advanced Air and Space Studies, Maxwell AFB, Alabama.

Major Golembiewski enlisted in the Air Force in 1987 and served in communications units in Louisiana, New York, and Illinois prior to being commissioned through Officer Training School in 1997. He has served in a variety of positions at the squadron, wing, agency, center, and major command levels, as well as having deployed to Operations Desert Shield and Desert Storm, Joint Forge, and Iraqi Freedom. The major is a graduate of the Marine Corps Command and Control Systems School and the College of Naval Command and Staff. Major Golembiewski has been selected to command the 92d Communications Squadron at Fairchild AFB, Washington.

Major Golembiewski is married to his high school sweetheart, and the couple has two teen-aged children.

ACKNOWLEDGMENTS

This year has been one of the most challenging of my Air Force career. The endless reading, continuous research, and demanding writing assignments were excruciatingly tough for me, and I cannot imagine having made it through without the patience, support, and help of several people.

Dr. Stephen Wright, my thesis advisor, helped me to narrow the scope of my research, structure my time, and balance my desire to save the world versus meeting my graduation requirement. My eyes are sometimes bigger than my stomach, and I frequently found myself chasing down rabbit holes to find interesting facts. Dr. Wright helped me keep focused on the prize: thesis completion.

Lieutenant Colonel John Davis similarly provided expert advice and insight. His attention to detail and talent for editing are second to none, and he has helped me appreciate the vices of using split infinitives and passive voice.

The staffs of the Muir S. Fairchild Research Information Center, affectionately known as the *AU Library*, and the Air Force Historical Research Agency, affectionately known as *the Archives*. Dealing with my endless questions, helping me find and view microfilms, guiding me through the Special Collections, administering the inter-library loans, finding documents I could barely describe, and providing the best customer service possible. On more than a couple of occasions I was *that guy* who held up end-of-day closing, begged for re-entry after forgetting my notebook, phone, or car keys in the facility, or set off an alarm because excitedly tried to run across the hall to my kennel without checking out the book that I had forgotten was still in my hand. A patient smile that could have easily been replaced by a frown or sigh shielded me from (excessive) embarrassment every time.

Most importantly, I want to express my sincere appreciation to my family. Policy prevents me from listing their names, but they are far from anonymous to me. I am blessed to have a wife who is always ready with encouraging words—I really needed a lot of them this year at SAASS. Our two kids made me laugh on days I wouldn't have otherwise cracked a smile. To my family—I love you—and, even though you won't care, this thesis is dedicated to you. Okay, it's done; let's go for ice cream.

ABSTRACT

This study examines the evolution of the Air Force communications officer, which in many ways parallels the evolution of the Air Force itself. Most apparent, both are inherently technology-based entities that trace their beginnings to the Army Signal Corps. Perhaps less apparent, both have also had to grapple with the questions of centralized control versus unity of command, generalization versus specialization, and manning quantity versus quality.

Each of these has influenced the way communications officers evolved. Starting with the signal officer of the American Civil War, early communications officers came to prominence because of the unique capabilities they provided. A modern communications officer, however, no longer provides that unique set of qualifications. Focused more on general management and leadership, the communications officer career field lost its way and no longer specializes in communications. This study looks at how and why this change occurred.

For the purposes of this paper, the evolution of the communications officer has been broken down into four epochs: that of the signal officer, the communications-electronics officer, the computer officer, and the cyberspace officer. In analyzing these epochs that differ greatly when it comes to communications technologies, some consistent characteristics become evident, such as the importance of organizational structures, the prominence of leaders and their biases, and the effects of personnel perceptions.

Communications obviously hinge on technologies and techniques, but the early evolution of the communications officer is better attributed to the people and organizations of each epoch rather than the equipment or means that were employed. As communications organizations

matured, however, they tended to take on a life of their own and did not owe their continued existence to specific individuals. That said, there was always the danger that a single person could be detrimental to the organization. This type of threat to communications organizations was personified by Secretary of War Edwin M. Stanton and Air Force Generals Larry D. Welch and Merrill A. McPeak.

Lastly, this study states conclusions and implications drawn from studying the evolution of the Air Force communications officer from his earliest days as a signal officer to today's cyberspace operations officer. By examining the history of the communications officer we can better discern the career field's future. If there is a future at all for communications officers, it is through the return to technical specialization. The communications officer must lead—but not as a generalized Air Force bureaucrat—as a highly trained, competent technical specialist providing communications, computer, and cyberspace expertise to the commander. That is—or at least should be—the future of the communications officer.

CONTENTS

Chapter	Page
DISCLAIMER	ii
ABOUT THE AUTHOR	iii
ACKNOWLEDGMENTS	iv
ABSTRACT	v
INTRODUCTION	1
1 THE SIGNAL OFFICER	9
2 THE COMMUNICATIONS-ELECTRONICS OFFICER	27
3 THE COMPUTER OFFICER	52
4 THE CYBERSPACE OFFICER	78
CONCLUSIONS	92
BIBLIOGRAPHY	100

Illustrations

Table

1	Army Air Force Communications Officer Military Occupational Specialties (MOS), 1945	43
2	Communications Officer Air Force Specialty Codes (AFSC), c1977	55
3	Computer Systems Officer Air Force Specialty Codes (AFSC), c1977	59
4	Communications-Computer Officer Air Force Specialty Codes (AFSC), c1986	62
5	Communications and Information Officer Air Force Specialty Codes (AFSC), c1996	69

Figure

1	Overall Communications Officer Timeline	3
2	First Epoch, 1860-1910	9
3	Second Epoch, 1910-1980	28
4	Third Epoch, 1980-2010	53

Introduction

In the period of reconstruction, technology decides everything.

Josef Stalin

In many ways the evolution of the Air Force communications officer has paralleled the evolution of the Air Force itself. Most obviously, both trace their ancestry directly to the Army Signal Corps. Also, it is not surprising that both are inherently technology based. The Air Force was born of the technological wonders of the airplane, though technological advances in space, missile, and cyberspace operations have transformed the current Air Force into something somewhat more than *just* an air service. Similarly, the subset of the Air Force known as Air Force communications is inherently technology based and born of early courier, signaling, and messaging capabilities, but technological advances have helped shape the field into something more than *just* a communications service.

Throughout its history, however, the communications officer has been faced with several challenges. One which especially stands out is the concept of specialization versus generalization. Initially a very technical career field, communicators are frequently thought of as technical authorities specializing in radio, radar, telephone, and computer systems. Requirements for increased efficiency, lower costs, and smaller manpower pools have diluted this technical astuteness over the years. In some cases specific communications specialties were neglected as they became obsolete. Others were simply watered down as career field specialties were consolidated to create more general-purpose officers.

Air Force officers in general, and especially the Air Force's pilot corps, tend to gravitate towards being generalists able to lead in a variety of situations and circumstances. While not inappropriate, this trend is far from ideal in technical career fields. In short, they could stop being technical career fields at all. That is the case with the modern communications officer: while still expected to provide technical solutions in a modern computerized world, but without its long-lost specialization communications officers are little more than interfaces between the Air Force and civilian contractors who provide technical solutions.

The bottom line is this: the Air Force communications officer, starting with the signal officer of the American Civil War, came to prominence because of the unique capabilities and skill he provided. A modern communications officer no longer provides that unique set of qualifications. Focused more on general management and leadership, the communications officer career field has lost its way and no longer specializes in communications.

This paper provides a portal into the development of the communications officer career field to help the reader understand why communications officers evolved the way they did and why they are important to our Air Force. By examining its history, we can better discern the career field's future. If there is a future at all for communications officers, it is through the return to technical specialization. The communications officer must lead—but not as a generalized Air Force bureaucrat—as a highly trained, competent technical specialist providing communications, computer, and cyberspace expertise to the commander. That is—or at least should be—the future of the communications officer.

Epochs

This study examines several different time periods. While the evolution of the communications officer obviously did not happen

overnight, significant events had dramatic effects on how the career field developed. While others may judge differently, there are certain points that can be described as epochs in the career field's chronology. The key epochs this study will scrutinize are the birth of the Army's Signal Corps, the introduction of electronic communications, and the computer revolution and the development of cyberspace.

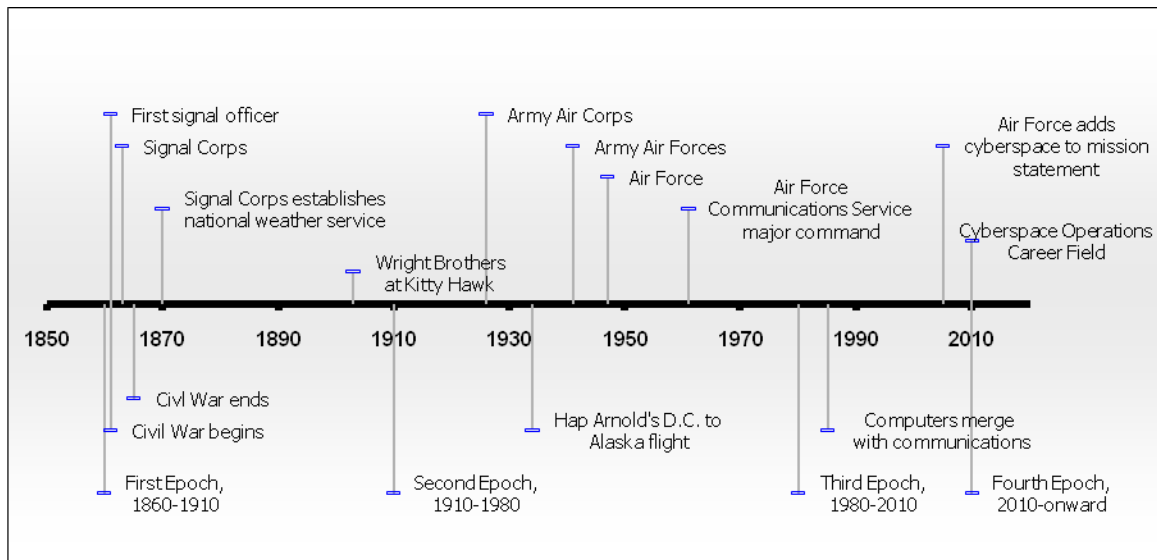


Figure 1: Overall Communications Officer Timeline

Source: Author's Original Work

Signal Corps

The birth of the United States Army Signal Corps just prior to the American Civil War is also the initial starting point for Air Force communications. Starting literally with only one officer, the Signal Corps' early mission was based on signaling communications using flags and torches. Quickly it grew, first to include electronic communications starting with the telegraph, and then by becoming America's first national weather service.

Electronic Communications

As electronic communications developed, the military quickly learned the importance of radio and radar devices. These pieces of equipment were emerging into widespread use at about the same time that the airplane was being developed. While the aviation section of the Signal Corps famously evolved into the United States Air Force, the communications capabilities of the corps, as this study will show, also had great impacts.

Computer Revolution and the Development of Cyberspace

The computer became key in calculations and production while the dawn of interconnected computers and the Internet went unnoticed by most Americans, but today cyberspace is considered a warfighting domain unto itself, on par with the land, maritime, air, and space warfighting domains. The Air Force communications officer, and the Air Force itself, are at a crossroads, and how each respond to the challenges of cyberspace will shape their future roles and missions for years to come.

Recurring Themes

As these epochs and associated periods of time are viewed, it is clear that a number of themes recur, creating conflict for communications officers and their career fields: The consolidation of specialties highlights the conflict between specialization and generalization; communication officers in identity crisis as they strive for operational relevance; and personnel matters as military forces are increased or decreased based on the nation's needs.

Consolidation

An obvious trait visible after just a cursory look at the development Air Force career fields in general, but certainly the Air Force communications officer career field in particular, is the ongoing consolidation of specialties into fewer less-focused conglomerates.

On the one hand, some assume that technology has made some things so easy that specialists are not needed anymore. On the other hand, it is very possible that the generalization of career specialties can be taken too far. Consider this: during the 1800s members of the Signal Corps initially specialized in flag signaling, then added telegraph operations, and finally weather observation and reporting to their list of duties. By 1945 the current edition of the *Army and Air Forces Manual 35-0-1, Military Personnel Classification and Duty Assignment*, listed 36 military occupation specialties that could be judged as being part of the communications officer family of jobs. By 1976 this list had been reduced to about 20 air force specialty codes, and in 2000 there were only four! Of those, one was reserved for group commanders and one for executive officers above wing level, which leaves only two specialties, one at staff level and one at base level, to cover almost the entire gamut of communications requirements.

Certainly, technological advances have made some earlier communications specialties, such as the Pigeon Officer, obsolete, but those advances have also introduced incredibly complex systems, equipment, and processes. Do two officer career fields adequately cover the spectrum of Air Force communications, computers, and cyberspace? That is a question this study will consider, and it is especially pertinent to ask as the Air Force has just recently deleted those two remaining communication officer career fields and created in their place a new cyberspace operations officer career field. This study will examine several major changes in the communications officer career field with an eye towards analyzing the career field mergers and divestitures that have made the career field what it is today.

Identity Crisis

The Air Force and its communications officer career field both suffer from a long standing sense of identity crisis. Both are

continuously seeking a more independent role in America's military, always endeavoring to be less *the supporting* and more *the supported*.

Even so, it is becoming evident that the roles of both are changing dramatically. The Air Force has evolved from a strategic bomber force to a jet fighter force, and is now evolving into a remotely piloted air force. At the same time, the communications officer has evolved from a radio and radar specialist to a computer and network generalist, and is now evolving into a cyberspace operator. A major distinction exists, however, between the two's ever changing roles. The Air Force is moving in its evolutionary path to an unmanned aerial force kicking and screaming; fighter pilots run the Air Force, and they are not anxious to see their aristocracy replaced. Meanwhile, the communications officer has long sought a more prominent operator's role in the Air Force hierarchy, and the move to cyberspace appears to be a leap in that direction.

As the Air Force communications officer career field plans its next step into the world of operations, it is useful to examine the historical context of the career field. This context will provide insight and enable better analysis of the career field's development.

Personnel

The changes to the communications officer career field can frequently be traced back to overall Air Force personnel requirements. During times of war the military expands and more people are needed; likewise, peace generally brings smaller militaries.

At the same time, the technical nature of communications systems has required highly educated and well trained individuals both in the role of every-day operations and in long-term strategic development and procurement. These demands are often in conflict, and the question of quantity versus quality can only be answered through compromise. This problem is compounded by a perception within the Air Force that technical officers are less valuable and, therefore, less likely to be promoted to higher levels within the service.

Reduced career field entry requirements, “dumbing down” of technical training, and career field mergers are some of the ways these problems have been dealt with. These steps have helped create a more generalized career field with debatably better career progression possibilities, but what has the service sacrificed in the process?

Conclusion

This framework provides a lens for studying the development of the Air Force communications officer. Studying the past and analyzing decisions made in their context will aid in today’s and tomorrow’s decisions.

In 2010 the communications officer career field went away, replaced by a cyberspace operations officer career field. It is too soon to tell if this new specialty will simply be communications by another name, but there is the potential that this change will be truly transformational. Already there is a noticeable shift in emphasis within the career field from traditional mission support communications to offensive and defensive cyberspace network operations. That begs the question, however: what happens to the traditional role of the communicator who has overseen radio, radar, and other signaling methods for over one hundred fifty years? That will have to be answered soon, but in the meantime, by analyzing previous changes and transformation, the Air Force communications officer career field will be better prepared for whatever awaits it.

Chapter 1

The Signal Officer

I am glad to return to the only two permanent things in Washington: the Washington Monument and General Greely.

Former President Taft upon returning to Washington as Supreme Court Chief Justice

The story of the Air Force communications officer begins, quite naturally, in the United States Army. New organizations do not just happen; people build them. And there are three people in particular who stand out as founding legends of the early Signal Corps: Albert J. Myer, Adolphus Washington Greely, and William “Billy” Mitchell.

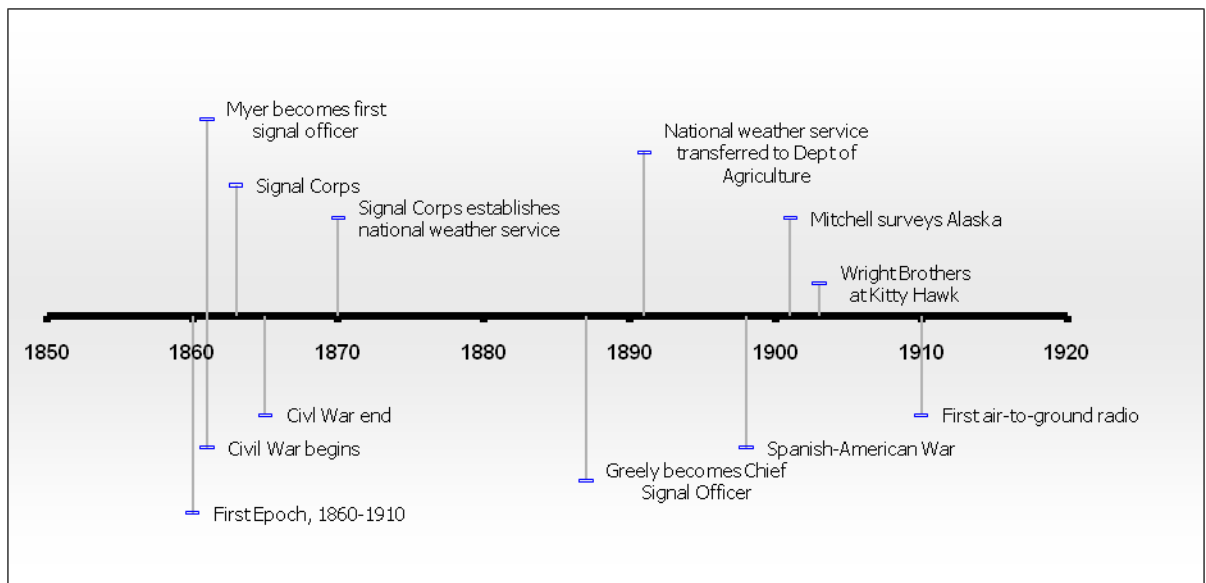


Figure 2: First Epoch, 1860-1910

Source: Author's Original Work

Birth of the Army Signal Corps

For as long as there have been wars, militaries have needed to communicate. The pages of history are filled with exciting accounts of militaries using couriers and signaling techniques to communicate, command, and control. Today's modern endurance foot race, for example, was inspired by the legendary Greek soldier Pheidippides who fell dead after running non-stop from Marathon to Athens to announce a great victory over the Persians in 490 BC. America's own story also contains adventurous tales of communications exploits. Though he took creative liberties in his telling, Henry Wadsworth Longfellow immortalized Paul Revere and his fateful ride at the start of the American Revolution by depicting the signaling scheme used to warn of the impending British invasion:

He said to his friend, "If the British march
By land or sea from the town tonight
Hang a lantern aloft in the belfry arch
Of the North Church tower as a signal light,
One if by land, and two if by sea;
And I on the opposite shore will be,
Ready to ride and spread the alarm
Through every Middlesex village and farm
For the country folk to be up and to arm."¹

While such stories can be surveyed throughout time and across militaries, it was not until just prior to the American Civil War that a professional communications service dedicated to a signaling and messaging mission was established. The United States Army was the first in the world to establish a separate branch dedicated to communications when Major Albert J. Myer, widely renowned as the

¹ Henry Wadsworth Longfellow, "Paul Revere's Ride," originally published in 1863 as part of Longfellow's poem collection *Tales of a Wayside Inn*.

father of the Signal Corps, was appointed in 1860 as the Army's first signal officer.²

While serving as an Army doctor at Fort Duncan, Texas, Myer devised a signaling system based on work he did in his medical dissertation on sign language for the deaf.³ The system, which came to be called *wigwag*, used flags during daylight hours and torches at night to communicate between troops at a distance. Myer actually called these systems *flag telegraphy* and *torch telegraphy*, and cumulatively, to avoid confusion with electric telegraphy, he called them *aerial telegraphy*.⁴

Myer first offered his signaling system to Secretary of War Jefferson Davis in 1856, but noting the plan lacked sufficient detail, Davis turned down the proposal.⁵ Later, as a senator, Davis would again oppose the signal plans, but Myer's persistence paid off and on 21 June 1860 President James Buchanan signed the appropriations bill into law approving the first signal officer position; on 27 June 1860 the Senate confirmed Myer's appointment as that signal officer.⁶ At that time, and for about two years, Myer was the only signal officer, and his role was largely to train soldiers who were temporarily detailed for signal duty. Then, in early 1863, a separate Signal Corps branch was authorized by Congressional Act to replace the detail system and instead let soldiers specialize in communications. Very specifically, the act directed that the Signal Corps be made up of: one Chief Signal Officer, rank of colonel; one lieutenant colonel; two majors; for each army corps and each military department, one captain and up to eight lieutenants; and for each commissioned officer, one sergeant and six privates.⁷ Finally,

² Rebecca Robbins Raines, *Getting the Message Through: A Branch History of the U.S. Army Signal Corps*, (Honolulu: University Press of the Pacific, 2005), 3.

³ Raines, *Getting the Message Through*, 5.

⁴ Max Marshall, *The Story of the U.S. Army Signal Corps* (New York: F. Watts, 1965), 8.

⁵ Raines, *Getting the Message Through*, 6.

⁶ Raines, *Getting the Message Through*, 7.

⁷ Marshall, *The Story of the U.S. Army Signal Corps*, 51.

Congress promoted Myer to colonel and, though already filling the role of Chief Signal Officer, now made that title official.

Changes in roles and responsibilities were not isolated to the top signal officer, however. Initially, as the term *signal officer* implies, his main function was flag and torch signaling. Almost from the start, reconnaissance responsibilities were paired with the Signal Corps. This made sense since messages were frequently relayed between temporary tactical signal stations that doubled as watch platforms. As signals specialists mastered new technologies their roles expanded even further.

As Chief Signal Officer at the beginning of the American Civil War, Myer had a profound intuition regarding technology and how it could be used by the Signal Corps. Following his successful implementation of aerial telegraphy using flags and torches, Myer next attempted to institutionalize electrical telegraphy within the corps. He created what he called a *telegraph train*, a series of horse-drawn wagons loaded with telegraph equipment especially designed for quickly providing temporary telegraph service in the field. Myer had very stringent and specific requirements for how the wagons were equipped, making them difficult to furnish, though the challenge paid off. This ancestor to modern mobile tactical communications proved very successful and was dubbed *the flying telegraph*.

The flying telegraph quickly expanded the signal officer role to include electrical telegraphy, which meant having to know basic electrical principles. This in turn led signal officers to be considered camp electrical engineers responsible not only for telegraphs but also any other electrical requirements, though for the most part that was probably just camp lighting. Amongst all these other responsibilities, there was also a requirement for cryptographic skills required to encode and decode messages transferred both by visual and electric means. Once these skills were learned this mobile communications van of the 1860s was ready to be tested in combat.

First used in the 1862 Peninsula Campaign and then at the Battle of Fredericksburg, the flying telegraph proved very useful.⁸ On 14 December 1862, the day after the main battle at Fredericksburg, the signal officer in charge of that flying telegraph wrote that Major General Ambrose E. Burnside “has often thanked us for the promptness with which dispatches were sent and answers received and has one of his aides in our tent almost all the time to receive dispatches for him.”⁹ Unquestionably, there were many who had a deep appreciation for Myer’s efforts to expand signaling capabilities using new technologies and techniques, but not everyone praised his efforts.

Surprisingly, despite very favorable results in the field, Myer’s use of telegraphy drew the unabashed scorn of Secretary of War Edwin M. Stanton. The Secretary had established a civilian War Department agency, United States Military Telegraph, to provide medium- to long-distance telegraph services during the war. Expecting accolades for this speculative venture, Stanton was incensed that his pet project was underappreciated while Myer’s efforts were praised. It further infuriated Stanton that his civilian agency wound up competing with Myer in pursuing qualified telegraph operators. Not willing to tolerate competition, Stanton, citing United States Military Telegraph’s mission to provide far reaching communications, ordered the Signal Corps to stop using electric telegraphy at once. Myer, however, saw no conflict. While he had provided communications services over long distances when necessary, he had concentrated on tactical communications. Nevertheless, the distinction was too fine for Stanton, and Myer was relieved of his command in 1863.¹⁰

⁸ George Raynor Thompson, “Civil War Signals, Part 2,” *Signal*, May-Jun 1954, 31.

⁹ Thompson, “Civil War Signals, Part 2,” *Signal*, 31-32.

¹⁰ Christopher H. Sterling, *Military Communications: From Ancient Times to the 21st Century* (Santa Barbara, CA: ABC-CLIO, 2008), 309.

Exiled from the day-to-day management of his beloved organization, the Signal Corps continued to benefit from Myer's leadership. Instead of brooding about his lost command, he made valuable use of his less demanding schedule to codify the first signal doctrine in his *A Manual of Signals: for the Use of Signal Officers in the Field*. With or without Myer at the helm, the Signal Corps continued to prove itself throughout America's Civil War, and many of the Union's top general's clearly saw the advantages of the enhanced communications his corps provided.

Major General George B. McClellan, for example, saw the value of such communications immediately; he strove to trail telegraph lines into every encampment. Having seen rudimentary use of such systems in the Crimean War, McClellan was enamored by the ability to command and control armies from a distance. Even more so, however, this Young Napoleon, as he was known early in the war, used the telegraph for self-serving strategic communications. Despite being two miles from the Rich Mountain battle, twenty-six miles from the Corrick's Ford skirmish, and in an entirely different state during the Battle of Philippi, McClellan's personal public affairs campaign ensured celebratory word went out quickly when his soldiers won even small victories.¹¹ McClellan's appreciation for and masterful use of battlefield communications helped erect a reputation that heralded him as the savior of the Republic. Not everyone, however, had such high regard for military communications.

As in any age, there were those during the Civil War who mistrusted technology and change. Superstitious mountaineers were awed and frightened by the supernatural cables that flowed from camp to camp and magically fed soldiers their battle instructions. Confederate soldiers were similarly distraught by McClellan's proclivity for signaling apparatus. When captured, one such soldier was heard to say, "No

¹¹ John C. Waugh, *The Class of 1846: From West Point to Appomattox: Stonewall Jackson, George McClellan, and Their Brothers* (New York: Warner Books, 1994), 265.

wonder they whipped us; they have the telegraph with them.”¹² Others, including many of McClellan’s own officers, simply viewed communications technologies as an unnecessary and untrustworthy nuisance.

For example, in 1863 at the Battle of Chancellorsville, Union Major General Joseph “Fighting Joe” Hooker, boasting “may God have mercy on General Lee, for I will have none,” established a complicated war plan that bordered on brilliance.¹³ Hooker’s administration of the battle might have become a model for applying operational art for future generations if not for the confusion and miscommunication that ensued.

Believing that General Robert E. Lee’s outnumbered Confederate troops were beaten and had no choice but to retreat, Hooker and many of his top officers let wishful thinking replace what they saw with what they wanted to see: a Confederate withdrawal. In fact, Lee was not retreating. He was dividing his forces in order to confuse, delay, and outmaneuver Hooker. Taking a huge risk, Lee hoped to defeat portions of Hooker’s forces before they could form a concentrated attack against him.

Poor reconnaissance and poor communication undoubtedly contributed to Hooker’s failure to comprehend Lee’s intentions. He counted on the telegraph lines connecting his headquarters to the most important outposts on both sides of the Rappahannock River to allow fast and easy coordination with his top generals. Unfortunately, as any communications officer knows, Murphy’s Law always applies. When the network went down, Hooker could not communicate effectively with other Union generals like Major General John Sedgwick.

Today’s military forces are well aware of their dependency on communications; a great deal of planning is done to provide network

¹² John C. Waugh, *The Class of 1846*, 263.

¹³ James M. McPherson, *Battle Cry of Freedom: The Civil War Era* (New York: Oxford University Press, 1988), 639.

redundancy and continuity of operations plans in case of system failures. Even in 1863 this was understood, and signal officers could generally fall back to manual signaling techniques when problems occurred.

Unfortunately, Hooker did not trust visual signaling and therefore made little use of his signalers. Even if he had, Sedgwick went as far as to prohibit the use of visual signals because he feared the enemy could read them despite the fact that signal officers were required to encode all important messages.¹⁴

There is no way to know if better communications would have changed the outcome at Chancellorsville, but a complicated war plan, such as Hooker's, certainly requires high levels of coordination and synchronization. Hooker's forces had the numerical advantage, but lack of situational awareness due, at least partly, to deficient communications may well have cost him his victory. The battle was not without cost to Confederates as many lives were lost, but the Battle of Chancellorsville is still known as General Robert E. Lee's masterpiece battle, though even the president did not know immediately how badly the battle had gone for the Union.¹⁵

President Abraham Lincoln could often be found in the War Department telegraph office, waiting for news from the battle fronts. For several days he received fragmentary and contradictory reports about Chancellorsville until, finally, on 6 May 1863 he learned how badly the Union had suffered. "My God! My God!" Lincoln exclaimed when he heard the news.¹⁶ After the battle additional telegraph lines were laid from Washington to major headquarter locations, and two signal officers were assigned to each corps.¹⁷ While some more conservative and traditional Army leaders would continue to trust in slower horse-riding

¹⁴ *Historical Sketch of the Signal Corps (1860-1941)*, 8-9.

¹⁵ Russell F. Weigley, *A Great Civil War: A Military and Political History, 1861-1865* (Bloomington: Indiana University Press, 2000), 228-229.

¹⁶ McPherson, *Battle Cry of Freedom*, 645.

¹⁷ *Historical Sketch of the Signal Corps (1860-1941)*, 9.

couriers over faster signalers, corporately, signal officers and communications systems rightfully received increased attention for the duration of the war. After the war, conversely, military communications took another turn.

Albert J. Myer was reinstated as Chief Signal Officer in 1867 by acting Secretary of War Ulysses S. Grant, and he spent “the postwar years fighting for the Signal Corps’ continued existence in the face of skeptics who saw no value in a permanent communications branch.”¹⁸ In 1862 the corps had 199 trained signal officers detailed to it.¹⁹ Now, after the post-war drawdown, Myer’s corps had only one lieutenant and two enlisted clerks, but he immediately set out to improve matters.²⁰

His first step was to start a pipeline of trained officers qualified to be junior signal officers. He visited the Naval and Military Academies to argue his case for increased, more consistent signal instruction, and even though he had no authority over curriculum and no authorizations to man, his arguments were persuasive. Both institutions wound up using Myer’s field manual as part of their curriculum.

The academies would provide officers with at least some basic signaling education, but Myer was not finished. Continuing to build a professional training program, he established his Signal Training School in 1868, though at first the school only consisted of his office where he rigged eight telegraph stations together to allow students to practice with them.²¹ In 1869, Myer moved his school to Fort Whipple, which became known as the home of the Signal Corps.²²

Getting a professional training program started was not easy, but the next question’s answer was even more elusive at first: how could a

¹⁸ Sterling, *Military Communications*, 309.

¹⁹ *Historical Sketch of the Signal Corps (1860-1941)*, Pamphlet No. 32, (Fort Monmouth, NJ: Eastern Signal School, 1942), 7.

²⁰ Marshall, *The Story of the U.S. Army Signal Corps*, 80.

²¹ Marshall, *The Story of the U.S. Army Signal Corps*, 81.

²² Marshall, *The Story of the U.S. Army Signal Corps*, 82.

military organization striving to remain relevant survive during peacetime? The solution became obvious to him by 1870: a new mission! He decided the corps needed a mission that was as necessary during peace as it was during war. The Signal Corps would take responsibility for weather observation and reporting.

Myer successfully lobbied for the weather mission, and on 15 March 1870 Secretary of War William W. Belknap assigned the Army's weather duties to the Signal Corps.²³ New mission in hand, Myer set his sights on forming a national weather service. Adolphus W. Greely is one of the men who would make it happen.

Adolphus Washington Greely's war-time experience included several major battles and at least three serious wounds. At the Battle of Antietam, known for being the bloodiest day of the Civil War, Greely was shot in the face; the bullet cracked his jaw, knocked out several teeth, and put him in the hospital for a month.²⁴ For some, such an injury might have ended military service, but Greely insisted there was still a war to fight and that he would fight it. Greely's tenacity can be traced back to his very first day in the Army.

When Fort Sumter was fired on Greely, then only seventeen, desperately wanted to answer the president's call for volunteers but was turned down three times due to his being under age. Prior to his fourth enlistment attempt, young Greely chalked the number 18 on the bottoms of his shoes. He then declared with all honesty that he was "over eighteen" and that he wanted to join.²⁵ This was not to be the last time Greely would use artistic license to achieve an objective he knew to be honorable; he would probably explain that the ends do not always justify the means, but that sometimes they do.

²³ Raines, *Getting the Message Through*, 46.

²⁴ Greely, *Reminiscences*, 75-78.

²⁵ Mitchell, *General Greely*, 7. Greely also tells this story, though perhaps not as eloquently, in his autobiography: Adolphus W. Greely, *Reminiscences of Adventure and Service: A Record of Sixty-Five Years* (New York: C. Scribner's Sons, 1927), 27.

Greely was commissioned at 18, and before turning 21 he had risen to brevet major in the volunteer Army.²⁶ Shortly after the war, on 27 May 1867, his 23d birthday, Greely was “mustered out of the volunteer army” and then appointed a second lieutenant in the 36th Regular Infantry.²⁷ By the end of the year Greely would find himself unexpectedly detailed to the Signal Corps.

As a second lieutenant, Greely was the junior officer in the Signal Corps in 1867, but his war-time experience, mental quickness, and resourcefulness set him apart from his fellow officers.²⁸ He came to be known as a jack-of-all-trades who could be depended on to get any job done.

In 1870, following successful assignments in Nebraska and Wyoming, Greely found himself involved in the genesis of a new venture—the United States Weather Bureau—and he “devoted all his efforts toward the organization and development of this new branch of the Signal Corps.”²⁹ In a post-war environment, there was no longer a need for a big Army, but instead of being reduced to nothingness, the Signal Corps found a new lease on life through the weather service. The weather service also provided a new reason for the Signal Corps to master the telegraph. After all, weather needed to be reported quickly over long distances, and while flags and torches could provide limited, tactical, and emergency signaling, a national weather service needed a more robust method of communicating.

In 1873 Congress directed the Signal Corps to establish a telegraph network system connecting lighthouses with the United States Life-Saving Service, predecessor to the United States Coast Guard.³⁰ At

²⁶ Greely, *Reminiscences*, 90-91. *Brevet* refers to an early promotion, probably temporary, where a higher rank is worn, often without an accompanying pay raise.

²⁷ Mitchell, *General Greely*, 42.

²⁸ Mitchell, *General Greely*, 49.

²⁹ Mitchell, *General Greely*, 49-50.

³⁰ Raines, *Getting the Message Through*, 50.

first the Signal Corps' weather reporting benefited mostly the east coast and Great Lakes shipping, but Chief Signal Officer Myer's telegraph system was expanding, and with it his Signal Corps expanded because its telegraph operators doubled as weather observers.³¹ "In 1874 Congress enacted legislation directing the War Department to build lines to connect military posts and protect frontier settlements in Texas against Indians and Mexicans."³² By 1875 Myer had become dissatisfied with the results of his more senior Signal Corps officers and sent Greely to Texas to build the telegraph system there.³³ For nearly a year Greely worked an average of twenty hours a day, but by the end of 1876 he had "constructed 1,100 miles of telegraphy lines, which handled both military and commercial messages."³⁴

"The Signal Corps' lines achieved their maximum mileage in 1881, when 5,077 miles were under its control."³⁵ Unfortunately, Albert Myer, the doctor who had birthed the Signal Corps and served as its Chief Signal Officer for 17 years did not live to see this milestone. Upon his death in 1880, Fort Whipple was renamed Fort Myer in his honor.³⁶ Just as one star, however, was extinguished from the Signal Corps prominence, another was becoming brighter.

"In succeeding years the mileage steadily dropped as commercial lines followed the railroads westward, and by 1891 only 1,025 miles remained under the Signal Corps' supervision. In total, the Corps was responsible for building 8,000 miles of telegraph lines," and much of that work had been directly overseen by a lieutenant named Greely.³⁷

³¹ Raines, *Getting the Message Through*, 51.

³² Raines, *Getting the Message Through*, 51.

³³ Mitchell, *General Greely*, 51.

³⁴ Mitchell, *General Greely*, 52.

³⁵ Raines, *Getting the Message Through*, 52.

³⁶ David L. Woods, *A History of Tactical Communication Techniques* (Orlando: Martin Co., 1965), 89.

³⁷ Raines, *Getting the Message Through*, 52.

In 1887, Captain Adolphus Greely was made Chief Signal Officer and promoted to the rank of Brigadier General.³⁸ Despite the Signal Corps' success in forming a national weather service that "enabled weather data to be disseminated so rapidly that weather maps could be plotted and forecasts made from one to three days in advance," vast changes were in store for the Signal Corps.³⁹ Both the War Department and Congress questioned the value of the branch, and though it continued to operate primarily as the nation's weather service, Greely knew the organization had to change to survive.

"Upon taking office as Chief, he completely reorganized the Weather Bureau, making it the leading meteorological organization in the world."⁴⁰ Greely not only changed the organizational structure of the Signal Corps, but he also established new procedures, systems, and publications. While these changes drew the Signal Corps away from its war-time mission, America was between wars and downsizing its military forces. With no battles to fight, the United States Army of Greely's time shrank in numbers and Congress reduced its budgets. Greely must have realized that providing the weather service kept the Signal Corps relevant even during times of peace.

The weather service was extremely successful and had become the bread and butter of the Signal Corps, but many in the nation worried that the Army was not the right organization to provide this service. In his 8 December 1885 letter to Congress, President Grover Cleveland, while praising the weather service provided by the Signal Corps, also stipulated it was "of a scientific nature" and "becoming more and more unsuited to the fixed rules which must govern the Army," and that it

³⁸ Mitchell, *General Greely*, 174.

³⁹ Mitchell, *General Greely*, 50.

⁴⁰ Mitchell, *General Greely*, 175.

should therefore be separately established.⁴¹ President Benjamin Harrison, in his 3 December 1889 letter to Congress, agreed that the national weather service should be separated from the Army:

The creation of an Executive Department to be known as the Department of Agriculture by the act of February 9 last was a wise and timely response to a request which had long been respectfully urged by the farmers of the country; but much remains to be done to perfect the organization of the Department so that it may fairly realize the expectations which its creation excited.... I recommend that the weather service be separated from the War Department and established as a bureau in the Department of Agriculture. This will involve an entire reorganization both of the Weather Bureau and of the Signal Corps, making of the first a purely civil organization and of the other a purely military staff corps. The report of the Chief Signal Officer shows that the work of the corps on its military side has been deteriorating.⁴²

Adolphus Greely had worked hard to create the world's preeminent weather service, and tried hard to keep it within the Signal Corps. With tightening budget constraints, he completely reorganized the service and made it an even more efficient organization. By perfecting various forecasting instruments and methods he decreased costs in the hopes that his successful weather bureau would escape the political eye. It did not work. While the writing had been on the wall for quite a while, Greely refused to read it. Finally, he succumbed to the political pressures mounted against him. Rather than letting someone else dictate the terms of surrender, however, he personally drafted the bill that would transfer the weather service to the Department of

⁴¹ James D. Richardson, ed., *A Compilation of the Messages and Papers of the Presidents*, Vol. 10, (New York: Bureau of National Literature, 1916), 4934.

⁴² James D. Richardson, ed., *A Compilation of the Messages and Papers of the Presidents*, Vol. 12, (New York: Bureau of National Literature, 1916), 5486-5487.

Agriculture.⁴³ By the end of 1890 it was all but done; the 15 November 1890 Report of the Secretary of War to the President proclaimed “the Weather Bureau Service, which has heretofore been under the charge of the Signal Corps, is to be transferred on the 1st day of next July to the Department of Agriculture.”⁴⁴ The Signal Corps was to maintain only a small military weather component.

Without its weather mission the Signal Corps quickly slipped into obscurity, though Greely continued to pursue other avenues of relevancy. Congress, however, introduced several bills intended to eliminate the corps altogether and many believed it was just a matter of time. There seemed little future for the communications officer of this age, but Greely’s perseverance paid off. His experimentations with visual and electrical communications extended the life of the corps just long enough for it to once again come into vogue during the 1898 Spanish American War. Deployed to Cuba, Puerto Rico, and the Philippines, the Signal Corps used flags, established tactical telephone services within camps, and used the telegraph for long-distance communications. “Thanks to Greely’s efforts, the War with Spain was the first conflict fought by the United States in which electrical communications played a predominant role.”⁴⁵ Still a man of humility and humor, when asked what his most important or difficult challenge had been, Greely responded, “Bringing up six children on Army pay.”⁴⁶ Humility aside, the force of Greely’s will kept the Signal Corps intact long enough to be needed again.

⁴³ Greely, *Reminiscences*, 174-175. Interestingly, in Mitchell, *General Greely*, 175, Mitchell says Greely always thought the Department of Agriculture was the logical place for the weather service and that it was Greely’s idea to move it there.

⁴⁴ *Report of the Secretary of War to the President, November 15, 1890*, compiled in *Annual Report of the Secretary of War, 1890-1891* (Washington: Government Printing Office), 15.

⁴⁵ Raines, *Getting the Message Through*, 91-92.

⁴⁶ Mitchell, *General Greely*, 236.

Throughout this period Signal Corps manning changed drastically. On 1 July 1884, for example, there were 20 Signal Corps officers, mostly detailed, and 500 enlisted soldiers, but following the Civil War the Army, and therefore the Signal Corps, was reduced significantly.⁴⁷ In 1898 another short period of growth due to the Spanish-American War, saw the Signal Corps grow from eight officers and 50 enlisted to a total strength of over 1,300 men, about 100 of which were signal officers.⁴⁸ The Reorganization Act of 1901 reduced the service down to 810 enlisted and 35 officers, but at least the corps still existed. Many had been predicting its disbandment for years, but instead it was about to find another calling.

Shortly after the Spanish-American War the Signal Corps was tasked with establishing telegraph links across the frozen frontier of Alaska. Greely had been a world-famous arctic explorer prior to becoming Chief Signal Officer; he understood the challenges this venture would entail. In 1901 he sent one of his most promising signal officers to the great white north to survey conditions in Alaska. That officer was First Lieutenant William “Billy” Mitchell.

Before he became enamored—or consumed—by the idea of creating a separate aviation service, Billy Mitchell was a signal officer who proudly numbered himself as one of Adolphus Greely’s disciples.⁴⁹ In 1901 Mitchell was a very brash twenty-one year old looking for excitement after returning from service in the Philippines. Seeking adventure, Mitchell volunteered to investigate telegraph installation problems in the frozen frontier of Alaska. Greely agreed, and off to Alaska Mitchell went.

Upon his return, Mitchell’s report to General Greely was of the effect that “the people trying to build the telegraph lines stayed in the house too much in the winter, and that if they got out and worked when

⁴⁷ *Historical Sketch of the Signal Corps (1860-1941)*, 27.

⁴⁸ *Historical Sketch of the Signal Corps (1860-1941)*, 34.

⁴⁹ Mitchell, *General Greely*, v.

it was cold, the lines could be built.”⁵⁰ In this context, the word *cold* is referring to 50 to 70 degrees *below zero*! Greely sent the overconfident officer back to Alaska to oversee the telegraph construction.

Naturally, Mitchell was successful, and he wrote: “To make a long story short, we completed the Alaska telegraph system, some 2200 miles, within two years, over trackless Arctic wastes, working winter and summer. During the last winter, we worked through temperatures under 60 below zero, for six weeks, our coldest recorded weather being 76 below zero.... Our lines opened Alaska up to civilization.”⁵¹

Not yet the aviation enthusiast he would later become, Mitchell continued to impact the communications community. By 1905 Mitchell was a signal instructor at Fort Leavenworth who had authored his own communications field manual. In it Mitchell explained that Signal Corps personnel, in addition to needing to be extremely well educated and knowledgeable of organization and tactics, also needed to be proficient in the subjects of electricity, reconnaissance, electrical and visual signaling, and encryption techniques.⁵² While his manual described communications systems and techniques in great detail, in it Mitchell also prophesized that one day wars would be fought not only on land and water, but under the sea and in the air.⁵³ To the air is where we go next.

⁵⁰ William Mitchell, “William Mitchell Papers,” Air University Library Microfilm 629.13 M682mw (m.f.), 1923, 62.

⁵¹ Mitchell, *General Greely*, 195.

⁵² William Mitchell, *Field Signal Communications (Second Lecture)*, (Fort Leavenworth: Infantry and Cavalry School, Department of Military Art, Signal Corps, May 1905), 21.

⁵³ Mitchell, *Field Signal Communications (Second Lecture)*, 21.

Chapter 2

The Communications-Electronics Officer

The British have said that World War II is a radio war and they can pretty nearly prove their case.

Henry “Hap” Arnold and Ira Eaker
Army Flyer

The twentieth century brought considerable changes to the Army and its Signal Corps, both technologically and organizationally. The Air Force as a whole rightly esteems the Wright Brothers’ 1903 launch of their Wright Flyer into controlled flight, but 1910 began a new epoch for Air Force communications. In this year, the Army successfully added aerial communications to its flying machine, thereby forging an unmistakable relationship between America’s air forces and communications systems. Now able to command the air-ways like never before, the advent of reliable wireless communications between the ground and the air ushered the era of the communications-electronics officer, extending from 1910 to 1980.

The period of the early 1900s is sometimes referred to as the military era of radio, though it is more than that.⁵⁴ New technologies were maturing, and communicators were thrust into a world of not just electricity, but electronics that encompassed matured telephone services, perfected radio transmission, and radar development. At about the same time, the Signal Corps’ small aeronautics office took on a life of its own, transforming first to a large aviation section with the Signal Corps, but then spawning an Army Air Service that continued to morph, first into the Army Air Corps, then the Army Air Forces, and finally a separate military branch, the United States Air Force.

⁵⁴ Linwood S. Howeth, *History of Communications-Electronics in the United States Navy* (Washington DC: Bureau of Ships and Office of Naval History, 1963), 207.

Determined not to be merely a carbon copy of the Army with wings attached, the Air Force adopted a very different type of organization. Those differences have had a profound effect on the formation of the Air Force's version of the Signal Corps.

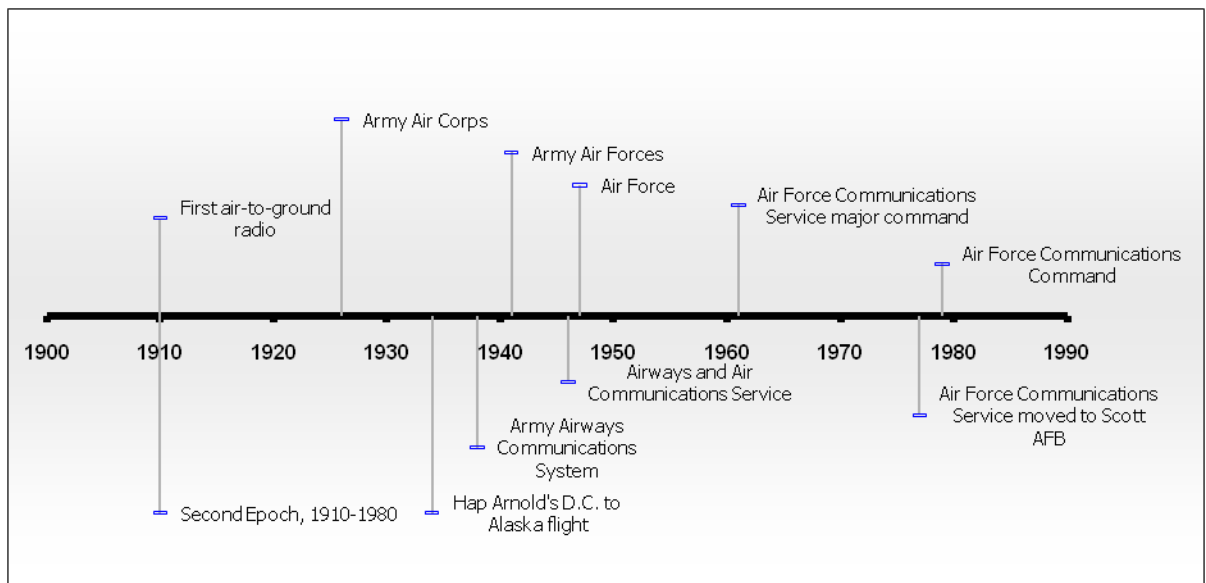


Figure 3: Second Epoch, 1910-1980

Source: Author's Original Work

The Air Arm and its Communications

In 1910 Benjamin Foulois did what the Army's Signal Corps had claimed impossible: he established wireless radio communications between the ground and an airplane in flight.⁵⁵ Foulois would become the Chief of the Army Air Corps in 1931, but in 1910 he was simply a stubborn signal officer and pilot—the only pilot in the Army—who did not know what the word *impossible* meant.

Foulois had enlisted in the Army in 1899, was commissioned in the infantry in 1902, and completed Signal School in 1908.⁵⁶ While in Signal

⁵⁵ Benjamin D. Foulois and Carroll V. Glines, *From the Wright Brothers to the Astronauts: The Memoirs of Benjamin D. Foulois* (New York: McGraw-Hill, 1968), 71-73.

⁵⁶ Foulois, *From the Wright Brothers to the Astronauts*, 47.

School he authored a thesis considered imaginative by some and foolish fiction by others. He envisioned a day when aerial fleets would use searchlights and flares to maintain communications between army components.⁵⁷ These air machines would provide up-to-the-minute reconnaissance of enemy positions and provide artillery spotting to improve the effect of the Army's fire power.⁵⁸ Some considered this vision merely the stuff of dreams, but Chief Signal Officer Brigadier General James Allen thought otherwise.

General Allen became the Army's Chief Signal Officer and head of the Signal Corps in 1906 when Adolphus Greely was promoted to major general and, consequently, transferred from the position he had held for 19 years.⁵⁹ Although Greely pursued aviation as a Signal Corps specialty, Allen made it a reality.

Like his predecessor, Allen encouraged the Signal Corps' technological and aerial advancements. Greely attempted several times, unsuccessfully, to establish a preeminent air service as part of the Signal Corps. In one attempt, he contracted with Professor Samuel P. Langley, director of the Smithsonian Institute, to create a flying machine that Langley called an aerodrome.⁶⁰ Allen, however, succeeded when he acquired a Wright airplane in 1908, and by 1909 the plane had been built and it was ready to be piloted.⁶¹

General Allen chose Benjamin Foulois to be that plane's pilot. His instructions were simple: He told Foulois, who had flown exactly once—as a passenger during that plane's flight test—"you'll learn those [flying] techniques as you go." Allen, who obviously had the utmost confidence

⁵⁷ Foulois, *From the Wright Brothers to the Astronauts*, 44.

⁵⁸ Foulois, *From the Wright Brothers to the Astronauts*, 45.

⁵⁹ Rebecca Robbins Raines, *Getting the Message Through: A Branch History of the U.S. Army Signal Corps*, (Honolulu: University Press of the Pacific, 2005), 123.

⁶⁰ Max Marshall, *The Story of the U.S. Army Signal Corps* (New York: F. Watts, 1965), 131-132.

⁶¹ Marshall, *The Story of the U.S. Army Signal Corps*, 132-133.

in Foulois, instructed him to “take plenty of spare parts—and teach yourself to fly.” Not to be caught unprepared, Foulois garnered a 54-minute training session under Wilbur Wright before embarking on his mission to become the Army’s air corps, albeit one-man deep.⁶² Some might have called this feat impossible, but to Foulois it was just another challenge to be taken head on.

Then, in 1910, Foulois extended his list of impossible accomplishments further when he and Frank L. Perry, a ham radio operator from Chicago, “rigged up” a wireless telegraph and sent messages between a ground station and the airplane.⁶³ One reason previous similar attempts had failed was because no one could figure out how to ground an airplane radio so that electrical current could flow. The answer, it turns out, was a simple connection between the radio and the aircraft’s metal frame. As simple as this seems today, however, “this was as important a technological breakthrough to aviation radio then as the airplane had been to human flight.”⁶⁴

This incredible accomplishment opened the era of communications-electronics for America’s air forces, even though those forces consisted of only a single pilot and single airplane until 1911 when General Allen convinced Congress to appropriate \$125,000 for Army aviation.⁶⁵ By the summer of 1911 the Army had five airplanes, three small balloons, and six officers who were certified pilots, and in 1912 these numbers increased to twelve pilots and twelve airplanes.⁶⁶ Even as this infant air corps began to blossom, however, there were moves afoot to separate it from its nurturing Signal Corps.

⁶² Foulois, *From the Wright Brothers to the Astronauts*, 1-2.

⁶³ Foulois, *From the Wright Brothers to the Astronauts*, 71.

⁶⁴ Foulois, *From the Wright Brothers to the Astronauts*, 73.

⁶⁵ Marshall, *The Story of the U.S. Army Signal Corps*, 133.

⁶⁶ Marshall, *The Story of the U.S. Army Signal Corps*, 134.

On 16 May 1912 Congressman James Hay introduced a bill to reshape Army aviation by removing it from the Signal Corps, and the House Committee on Military Affairs held hearings to determine the merits of such a move. Opposing the move, Assistant Secretary of War Henry S. Breckinridge objected on the grounds that “it transferred duties handled by one branch of the service to three different branches—the Aviation Corps, the Signal Corps, and the Quartermasters Corps. Such division of duties would require that in each of these corps trained technical personnel be provided similar to that already existing in the Signal Corps.”⁶⁷ Chief Signal Officer Brigadier General George P. Scriven took this opportunity to ask for an increase in aviation personnel while testifying that aviation should remain part of the Signal Corps.⁶⁸

Notably, of the many War Department and Signal Corps personnel to testify before the committee, only one person, Captain Paul W. Beck, urged for a separate aviation organization.⁶⁹ Even more notable, a certain Captain William Mitchell was among those testifying that aviation should remain in the Signal Corps.⁷⁰ Mitchell said that aviation was, at most, a reconnaissance device, and therefore an integral part of the Signal Corps’ communications system, and that “the offensive value of this thing has yet to be proved.”⁷¹ Lieutenant Henry “Hap” Arnold was also among the Signal Corps officers who testified that the Signal Corps and aviation perfectly complemented one another.⁷²

Instead of extracting the aeronautics office from the Signal Corps, on July 1914 Congress established it as the Signal Corps’ Aviation

⁶⁷ Army Air Forces Historical Studies No. 25, *Organization of Military Aeronautics, 1907-1935 (Congressional and War Department Action)*, (Historical Division, Assistant Chief of Air Staff, Intelligence), 14.

⁶⁸ Army Air Forces Historical Studies No. 25, 15.

⁶⁹ Army Air Forces Historical Studies No. 25, 15.

⁷⁰ Army Air Forces Historical Studies No. 25, 15.

⁷¹ Alfred Hurley, *Billy Mitchell: Crusader for Air Power* (New York: F. Watts, 1964), 17.

⁷² Hurley, *Billy Mitchell*, 17.

Section and authorized it to have 60 officers and 260 enlisted soldiers.⁷³ In 1918, however, during World War I, President Woodrow Wilson believed that Chief Signal Officer Major General George O. Squier was “overburdened by the task of directing military aeronautics and, at the same time, carrying out his responsibilities for such other Signal Corps functions as photography, cryptography, and radio,” and thus removed aviation from the Signal Corps and created the Army Air Service.⁷⁴

Eight years later, in no small part due to the antics of Billy Mitchell, the Army Air Corps Act of 1926 further elevated the status of Army aviation.⁷⁵ Though Mitchell and others had hoped the act would provide their organization with the type of autonomy the Navy’s Marine Corps enjoyed, it did at least elevate the air arm to equal footing with other corps like the Signal Corps and the Quartermaster Corps. By 1940 the idea of an independent air force drew more consideration, but top Air Corps officers knew that meant handling their own support, such as personnel, communications, and supply functions, and they were not ready for those responsibilities. Instead, in 1941, another intermediate step was taken with the establishment of the more autonomous Army Air Forces with General Henry “Hap” Arnold in command.⁷⁶ By the end of World War II the time was right and the National Security Act of 1947 created the United States Air Force.

Creating a new military branch was no simple feat. Air leaders knew they wanted more than just a flying army; they wanted something better than the Army. One of the biggest questions facing the infant air

⁷³ Herman S. Wolk, *Planning and Organizing the Postwar Air Force, 1943-1947* (Washington DC: Office of Air Force History, 1982), iii.

⁷⁴ Bernard C. Nalty, *Winged Shield, Winged Sword: A History of the United States Air Force, Vol. 1* (Washington DC: Air Force History and Museums Program, 1997), 50.

⁷⁵ Nalty, *Winged Shield, Winged Sword, Vol. 1*, 103.

⁷⁶ Geoffrey Perret, *Winged Victory: The Army Air Forces in World War II* (New York: Random House, 1993), 55.

arm was how to manage people. In particular, civilian and military air bosses disagreed greatly on how to manage officers.

Air Force officers developed, of course, from Army officers. Despite some outwardly obvious similarities, however, the officer structure of the Air Force was deliberately created to be very different from the Army's. When they were elevated from an Army Air Corps to the almost autonomous Army Air Forces, these officers were still almost all pilots. Senior leaders knew that a future, independent Air Force could not rely on the Army to supply support officers, and so steps were taken to develop them in-house. "When the guidelines for the independent Air Force were laid down in the late 1940s, one of the most important decisions was the rejection of the Army system, which grouped specialties into corps. Instead, the majority of the officers were placed in a single body, the Officers of the Line of the Air Force (line officers) and specialties were grouped into career fields."⁷⁷

The Army corps system and the Air Force career field system seem similar at first glance, but the differences emerge upon closer inspection. The Army, instead of centrally controlling its officers, assigned them to a semi-autonomous corps, sometimes called a branch. The corps system was generally disdained by Air Force leaders for two reasons. First, they were convinced that "personnel were likely to become overly specialized and therefore not sufficiently qualified to perform general duties."⁷⁸ Second, and probably more important to most, was the empire building associated with the corps system. An officer's corps had immense control over the officer, especially when it came to assignments, specific job selections, and even promotions. Each corps, such as the Air Corps or the Signal Corps, could generally decide for itself how much it should

⁷⁷ Vance O. Mitchell, *Air Force Officers: Personnel Policy Development, 1944-1974*, (Washington DC: Air Force History and Museums Program, 1996), 284.

⁷⁸ Wolk, *Planning and Organizing the Postwar Air Force*, 201.

support the other corps, which led to bickering, horse trading, and attempts of politically maneuvering between corps.

Senior Air Force leaders found the corps system so distasteful that several even disapproved a simple career field system; they feared these career fields would gain power as the corps had within the Army. General officers had no intention of letting that happen. Major General Muir Fairchild voted an adamant “I am against it,” as did General George Kenney, Lieutenant Generals George Stratemeyer and John Cannon, and Major General Elwood Quesada.⁷⁹ Despite apprehension, and with safety catches applied, the new system prevailed. It was clear that while an Army corps enjoyed a certain amount of autonomy, the Air Force career field was to be merely an administrative aid for centralized control of Air Force officers. The career field system was intended to both avoid the internal power struggles between corps seen in the Army, and to establish a mindset in the Air Force where line officers considered themselves Air Force officers rather than pilots, communications officers, or whatever their specialty might be.⁸⁰

Still, having officers identifying themselves as specialists is not a bad thing. The Air Force needs specialists. It always has. Early senior leaders were trying to point out that an officer’s allegiance should be to the Air Force, not just a corps or a career field. To a large extent, the service has achieved that goal, though there are still organizational levels to which officers do—and should—feel allegiance.

The other goal of the career field system, however, was eliminating the near-autonomous power associated with a corps. Did the Air Force achieve this? The answer here is not clear cut. In this new Air Force there was no Pilot Corps, for example, that owned and centrally controlled all pilots. At the same time, the Air Force had yet to create a

⁷⁹ Mitchell, *Air Force Officers*, 65.

⁸⁰ Mitchell, *Air Force Officers*, 285.

centrally managed assignments system. In theory a general headquarters controlled assignments, but in practice commanding officers had a lot of say in where their officers were assigned. Those who were in charge of major commands had almost absolute control over personnel assignments within their command, and they wanted to keep that control. That is one reason they fought so adamantly to prevent an Army like corps system.

Thus it became official: the new Air Force had its personnel, and it administratively categorized those personnel by career fields. A nuance to many people; choosing this path helped, however, to provide an overall unity of command within the Air Force. It was an officer's chain of command that steered the officer's future, not some corps commander with no ties to the officer's current duties or mission. With this personnel matter settled, the Air Force could focus on other needs. One among many: this new Air Force would need to communicate.

The United States Air Force needed a communications system, but it could not be limited by the old-fashioned but dependable wirings that connected such systems. Benjamin Foulois had proven the radio could be used as a means to communicate between the air and the ground, but being possible is different from being practical. Despite its advantage over wired communications, the aerial radio presented its own set of challenges that were not easily overcome.

Wired communications had seen their dawn with the telegraph in the American Civil War, and by World War I the telegraph and telephone had proven extremely effective. World War I, as a matter of fact, with its heavily static, entrenched warfare, was perfectly suited for wired communications that ran forward "to the barbed wire."⁸¹ Although the nature of war had not changed with the advent of World War II, wars were certainly fought differently. Tanks and airplanes simply could not

⁸¹ Dulany Terrett, *The Signal Corps: The Emergency (to December 1941)* (Washington DC: Office of the Chief of Military History, 1956), 133.

be tethered by cables and wires, but radio provided a wireless alternative.

In the 1890s the Signal Corps began experimenting with radio, but these primitive electric machines were very different from the miniaturized transistor-based radios used in recent times. Early radios were cumbersome, large units that were, for the most part, limited to Morse code transmissions.⁸² Foulois transmitted the first radio message from an aircraft in 1910, and by 1920 the Signal Corps was very actively experimenting with more advanced air-to-ground and ground-to-air systems.⁸³ By 1923, prompted by Brigadier General Billy Mitchell's "interest in cross country flights, the Air Service began to establish an Air Alert Net consisting of radio stations which provided air-to-ground and point-to-point communications as well as the dissemination of weather data," though by 1938 it had only created 33 stations.⁸⁴

Aircraft communications service suffered for a variety of reasons, not least of which was the apathy of both Army post commanders and the pilots themselves. Radios were heavy and complex, so a pilot whose airplane was equipped with a radio was trading fuel or cargo capability for a device that was very difficult to use. "Reception in an airplane was annoying, if not absolutely impossible at times. The whirl of the engine and the interference of the ignition created a rasping static. What was more serious, crude and complicated wiring introduced a hazard that had more than once forced a pilot to bail out because of fire."⁸⁵ Many

⁸² Max Marshall, *The Story of the U.S. Army Signal Corps* (New York: F. Watts, 1965), 157.

⁸³ Foulois, *From the Wright Brothers to the Astronauts*, 71; Randy Baumgardner, *AACS Alumni Association: 1938-2004* (Paducah, KY: Turner, 2004), 8.

⁸⁴ Thomas S. Snyder, *Air Force Communications Command, 1938-1991: An Illustrated History* (Air Force Communications Command Office of History: Scott Air Force Base, IL, 1991), 1.

⁸⁵ Louis Shores, *Highways in the Sky: The Story of AACS* (New York: Barnes and Noble, 1947), 4.

pilots would not tolerate a radio in the plane. Charles Lindbergh, for example, made his famous 1927 transatlantic flight without a radio.⁸⁶

But in 1934 Lieutenant Colonel Hap Arnold had a different mindset. Intent on proving the airplane “was here to stay,” he enforced strict safety measures when he “led a mass flight of ten Army bombers over 8,000 miles from Washington, DC, to Alaska.”⁸⁷ One of those safety measures included assigning Captain Harold M. McClelland as his communications officer for the flight. McClelland was known as one of the few pilots in those days who “understood the importance of radio in relation to flying,” and he worked day and night with his assistant, First Lieutenant Ivan L. Farman, to install and configure radio equipment in Arnold’s planes.⁸⁸ Arnold’s planning led to a successful flight and his being awarded the Mackay Trophy for a second time, but that was not the end of it. Their success also inspired Arnold and McClelland to pursue the establishment of “an effective, integrated, *centrally managed*, military airways communications system.”⁸⁹

On 28 October 1938, despite there being a half dozen air officers with seniority to him, Hap Arnold became Chief of the Air Corps; less than three weeks later he activated the Army Airways Communications System.⁹⁰ This new organization integrated communications “under the direction and control of the Chief of the Air Corps,” and its mission was to “provide three basic services: communications from station to station along the airways and between ground stations and the man in the air;

⁸⁶ Shores, *Highways in the Sky*, 4. However, record setters like Lindbergh frequently used a minimalist approach to achieve greater speed and distance. A. Scott Berg, *Lindbergh* (New York: Putnam, 1998) refers to Lindbergh’s plane as a “two-ton flying gas tank” because Lindbergh sacrificed every possible bit of weight for more fuel capacity. He flew with no parachute, radio, brakes, and even without a front windshield (he used a periscope to see ahead).

⁸⁷ Shores, *Highways in the Sky*, 3-5.

⁸⁸ Shores, *Highways in the Sky*, 3-5.

⁸⁹ Snyder, *Air Force Communications Command, 1938-1991*, 3. But the emphasis on *centrally managed* is added.

⁹⁰ Perret, *Winged Victory*, 31-32.

dissemination of weather data from points of observation throughout the system to every unit having need of this information; and control of air traffic through radio and other navigational aids.”⁹¹ Similar to Albert J. Myers initial Signal Corps of one, Major Wallace G. Smith, as the designated Air Corps communications officer, had his entire headquarters in “a single manila folder in the third drawer” of his desk.⁹² This would change, however.

In 1939 the new communications organization was authorized only three officers and 300 enlisted personnel to man 33 communications stations scattered across the United States.⁹³ These stations operated 24 hours a day, seven days a week, and even at the time, the average 27 dollar a month salary did not create enthusiasm for the job.⁹⁴ Even when communications personnel were assigned to an Army post, as opposed to isolated communications relay stations, local Army commanders created frictions by assigning additional duties and details to communications technicians. Captain Russell A. Wilson, commander of the First Communications Region which covered the stations from the Rocky Mountains to the Pacific, would travel from site to site with a fiery “hands-off-my-men!” message for local commanders.⁹⁵ Tenuous tenant-unit relationships between communications units and host recurred until the early 1990s when Air Force Chief of Staff General Merrill A. McPeak’s *One Base, One Wing, One Boss* policy forced the assignment of communications squadrons directly to the local wing.

By 1941, just prior to America entering World War II, the airways service expanded dramatically, both throughout the United States and abroad. In May of 1941 it established its first international site at Gander

⁹¹ Snyder, *Air Force Communications Command, 1938-1991*, 5.

⁹² Baumgardner, *AACS Alumni Association*, 9.

⁹³ Baumgardner, *AACS Alumni Association*, 9.

⁹⁴ Shores, *Highways in the Sky*, 19.

⁹⁵ Shores, *Highways in the Sky*, 22.

Lake, Newfoundland, followed by stations at Goose Bay, Labrador, and then in Greenland, Iceland, and the British Isles.⁹⁶ Similar to Greely's expedition to the Arctic and Mitchell's telegraph installation in frozen Alaska, most of these sites imposed severe hardships with temperatures as low as 50 degrees below zero. By December 1941 there were only six communications officers and 2,043 enlisted personnel to operate 65 stations in the United States and 23 overseas, but these numbers continued to grow after America joined the war.⁹⁷ As the size of the military increased, the service set up additional communications sites in the North Atlantic, South Atlantic, Caribbean, European, Pacific, African, and Alaskan theaters.⁹⁸

While critical communications sites were established all over the world, many of them wound up being in very austere locations. Though isolation and severe climates created hardships for communicators at these sites, conditions were often made even worse because of the tendency for Army units to highjack enlisted communicators for details and additional duties. Communications officers, the few that there were, often found themselves in the position of having to match up against local commanders to protect communication manning. While there are many such stories, one favorite took place in Presque Isle, Maine.⁹⁹

During World War II, Presque Isle Army Air Force Base, Maine, was home to an Army Air Forces ferrying unit, part of the Air Transport Command. It is also where, in 1942, Major Ivan L. Farman worked to establish communications links across the North Atlantic. As a lieutenant, Farman was Harold McClelland's assistant communications officer for Hap Arnold's Alaska flight. Now, as a major, Farman commanded the 8th Airways Communications Squadron and, starting in

⁹⁶ Snyder, *Air Force Communications Command, 1938-1991*, 8. Newfoundland and Labrador together became a Canadian province in 1949.

⁹⁷ Baumgardner, *AACS Alumni Association*, 17.

⁹⁸ Snyder, *Air Force Communications Command, 1938-1991*, 8-40.

⁹⁹ My wife and I are from Limestone, Maine, about 20 miles from Presque Isle.

Presque Isle, he planned to relay communications across Newfoundland, Greenland, Iceland, and all the way to Europe, but his first hurdle was obtaining additional trained personnel.¹⁰⁰

Realizing his request for trained communications specialists was just a pipedream, Farman decided to take matters into his own hands. He set up his own school at Presque Isle to train officers and enlisted men on radio operations, radio maintenance, and cryptography. Then, the next step was to get soldiers to train. An aggressive officer, in a request for additional men Farman wrote, "Send me men. Even if they know nothing about communications, send them. All I want is basics. I'll train them myself."¹⁰¹

Amazingly, within a month Farman started to receive an influx of personnel. When the first six men arrived, however, the host base unit, headed by a major, commandeered the new troops. Farman, who was known to his troops as Ivan the Terrible, immediately found the Air Transport Command major and explained how things were going to work between them. In a menacing tone, Farman explained that if the other officer ever tried to take communications men or equipment again, "I'll hit you squarely between the eyes."¹⁰² Farman's men were returned.

It is hard to imagine such conversations between commissioned officers in today's Air Force, and even in Farman's time it is unlikely that such altercations were commonplace. With communications sites chronically undermanned, however, it took resourcefulness and determination to assure uninterrupted service. Farman and communications officers like him needed to have both technical savvy and resolve to adequately operate unpopular communications sites. It was a never-ending battle, however, to ensure vital communications links

¹⁰⁰ Air Force Biography, "Brigadier General Ivan Lonsdale Farman." <http://www.af.mil/information/bios/bio.asp?bioID=5389> (accessed 24 February 2010); Shores, *Highways in the Sky*, 36, 51-57.

¹⁰¹ Shores, *Highways in the Sky*, 57.

¹⁰² Shores, *Highways in the Sky*, 56

were manned effectively. Even when trained personnel were available, communications officers had to overcome other obstacles. Sometimes it was military life itself, with its Spartan regulations and rules that caused problems for communicators.

Military life is filled with restrictions not known in the civilian world, and while those restrictions are generally required to ensure good order and discipline, a commanding officer or supervisor does have some latitude in treating infractions. Communications officers understand the rigors of their specialty, but sometimes officers from other fields fail to realize—or consider—those rigors. For example, on another occasion Major Ivan Farman returned to his Presque Isle station to find his men had been punished for the condition of their barracks. This in itself did not bother Farman, but when he found out the conditions he became furious.

The men had been working a horrendous schedule—6-hours-on, 12-hours-off—just to keep things running. As if that was not bad enough, several men wound up in the hospital with pneumonia, so the remaining men ran themselves ragged to maintain their 24-hour operations schedule taking only short nap breaks. Adding insult to injury, an unexpected inspection caught the men with unmade bunks.

Hearing this, Farman went ballistic. He grabbed a phone and called the commanding general's office with an ultimatum: "You can have your choice, G.I. or communications. We don't have enough men to give you both. Which will it be?"¹⁰³ In response, the write-ups were rescinded and his men were left alone.

This type of abrasiveness would likely end an officer's career early in today's Air Force, but during World War II, with its shortages of people, Farman and men like him provided the leadership needed to protect an otherwise fragile subset of the growing Army Air Force.

¹⁰³ Shores, *Highways in the Sky*, 57

Thriving in this era of communications-electronics, Ivan the Terrible went on to command several wings and serve as Air Research and Development Command's Assistant Deputy Commander for Weapon Systems prior to retiring in 1957 as a brigadier general.¹⁰⁴ Long before that retirement, though, officers like Farman helped mold the shape of World War II communications organizations.

In 1943 the Army Airways Communications System became the Army Airways Communications System *Wing*, and it, along with the Army Air Force Weather Service, were now assigned to the new Flight Control Command.¹⁰⁵ Some considered this a step down because the communications service no longer reported directly to the Chief of the Air Corps, but the benefit of this move was that the airways leader, previously a staff officer, was now designated a wing commander. A wing needs a commander, and who would that be? Ivan Farman—now a colonel—took command in November 1943.¹⁰⁶

Very soon the communications service, while retaining its wing designation, was reassigned to Headquarters Army Air Forces, but at the end of 1943 it was elevated to a command with eight wings under it.¹⁰⁷ Practically overnight Farman went from being a wing commander with 15,000 people assigned to leading a major command of nearly 50,000 military members.¹⁰⁸ This centralized control system with highly standardized wings distributed across the service quickly proved itself capable, flexible, and efficient. These organizational changes reflected the vast responsibility placed upon communications officers at the time, to include the expanding number of specialties in the communications

¹⁰⁴ Air Force Biography, "Brigadier General Ivan Lonsdale Farman." <http://www.af.mil/information/bios/bio.asp?bioID=5389> (accessed 24 February 2010); Shores, *Highways in the Sky*, 36, 51-57.

¹⁰⁵ Shores, *Highways in the Sky*, 148.

¹⁰⁶ Air Force Biography, "Brigadier General Ivan Lonsdale Farman."

¹⁰⁷ Snyder, *Air Force Communications Command, 1938-1991*, 8-42.

¹⁰⁸ Air Force Biography, "Brigadier General Ivan Lonsdale Farman."

arena. By 1945 there were 36 distinct officer military occupational specialties that can be considered part of the communications officer family (see Table 1).

**Table 1: Army Air Forces Communications Officer
Military Occupational Specialties (MOS), 1945**

MOS	Description	MOS	Description
0140	Radar Officer	2120	Administrative Officer
0141	Electronics Officer (Formerly Radar Officer, Air)	2121	Administrative Inspector
0142	Radar Observer, Bombardment (Designated Set)	2159	Air Traffic Service Officer
0145	Radar Maintenance and Repair Officer	4402	Maintenance and Repair Officer, Airborne Signal Equipment
0160	Radar Filter Officer	4415	Signal Equipment Maintenance and Repair Officer
0200	Communications Officer	2680	Communications Inspection Officer
0210	Signal Officer	4400	Signal Supply Officer
0220	Message Center Officer	7888	Radar Observer, RCM
0224	Message Center Officer, Cryptographic	7050	Design and Development Officer (Designated Type)
0240	Pigeon Officer	7052	Photographic Equipment Engineer
0400	Telephone and Telegraph Officer	7704	Telephoto Officer
0410	Telephone and Telegraph Officer, Inside Plant	7916	Photomapping Officer
0430	Telephone and Telegraph Officer, Outside Plant	8205	Weather Engineering and Survey Officer
0500	Radio Officer	8537	Motion Picture Technical Officer
0503	Radio Officer, VHF	8219	Weather Officer
0520	Radar Observer, Night Fighter	8502	Aerial Photography Officer
2110	Adjutant or Adjutant General	8540	Still Photography Officer
		9600	Cryptanalytic Officer, General
		9610	Security Officer, Cryptographic

Source: Data derived from Army Air Forces Manual 35-0-1, Military Personnel Classification and Duty Assignment, 1 July 1945.

The large number of communications officer specialties is no surprise. Recognizing the need for such diverse technology experts,

General Hap Arnold stressed their importance both in day-to-day flying and in combat. He pontificated that “the general whose communications have broken down has generally lost the battle.”¹⁰⁹ Theodore von Karman, in his “Science: The Key to Air Supremacy,” documented that “the idea that all officers are able to direct any kind of organization, military, technical or scientific is out-of-date.”¹¹⁰ It was obvious that personnel, even officers, were not interchangeable. It was just as obvious that specializing could—probably would—cost officers in the end. Even Hap Arnold was powerless to change this perception; he wrote that success as a communications officer, or any technical career specialty, prevented otherwise capable officers “from rising to the highest command heights.”¹¹¹ The Air Force has never dispelled this perception.

Over time, as the military became more comfortable with its technological advances, some specializations became obsolete or redundant. The pigeon officer is a great example of a specialty that had been of high value prior to World War II, but quickly became unnecessary. These flying messengers had been used by militaries at least as far back as Genghis Khan’s pigeon relay system across Asia and much of Europe around the year 1200, and while the United States Army had been downsizing its pigeon force in the early 1900s, use was revived for World War I.¹¹² Shortly after World War II, however, technology prevailed and the pigeon officer was deleted from the Army Air Force officer specialty listing.

By the end of World War II, the Army Airways Communications System was a command with a worldwide mission and “possessing 8

¹⁰⁹ Henry H. Arnold and Ira Eaker, *Winged Warfare* (New York: Harper & Brothers, 1941), 43.

¹¹⁰ Orville Laird, “A Career for Communications and Electronics Officers in the USAF” (Maxwell AFB: Air War College, March 1950), 54.

¹¹¹ Henry H. Arnold and Ira Eaker, *Army Flyer* (New York: Harper & Brothers, 1942), 216.

¹¹² Christopher H. Sterling, *Military Communications: From Ancient Times to the 21st Century* (Santa Barbara, CA: ABC-CLIO, 2008), 355-356.

wings, 21 groups, 55 squadrons, and more than 700 detachments. Its 49,400 military personnel operated 819 different stations throughout the world with a total of 1,173 point-to-point positions, 574 control towers, 448 ground-to-air positions, 219 message centers, and 1,332 different navigational aid facilities.”¹¹³ The number of communications specialists sky rocketed to 4,454 officers and 44,946 enlisted personnel. The increased number of new communications systems being developed largely drove this substantial growth.

Throughout the war years the Army Airways Communications System organization steadily introduced new equipment and new techniques. In addition to the manually operated wireless radio telegraph, it also introduced radio teletype, facsimile, and automatic high speed transmission equipment and most messages were encrypted using electrical encryption devices.¹¹⁴ Another critical technological advance during World War II was a radio and microwave technique used to detect the position of enemy aircraft, a process originally referred to by the British as *radiolocation* or *radio direction finding*, but eventually coined *radio direction and ranging*, or *radar*, by the United States Navy.¹¹⁵ During World War II the atomic bomb was the only technical project to have more resources allocated for its development than radar; it has been said that while the bomb may have ended the war, radar was what won it.¹¹⁶

Despite all of the wartime communications successes, the military saw a diminished need for a communications service when the war

¹¹³ Baumgardner, *AACS Alumni Association*, 19.

¹¹⁴ Snyder, *Air Force Communications Command, 1938-1991*, 8-43.

¹¹⁵ Linwood S. Howeth, *History of Communications-Electronics in the United States Navy* (Washington DC: Bureau of Ships and Office of Naval History, 1963), 443. The word radar is really an acronym, but it has enjoyed such widespread use that it is generally no longer written in capital letters.

¹¹⁶ Mark Denny, *Blip, Ping & Buzz: Making Sense of Radar and Sonar* (Baltimore: Johns Hopkins University Press, 2007), 9. Several sources indicate Lee Dubridge, an American physicist who was prominent in radar's development famously first said something to the effect of "The bomb may have ended the war, but radar won the war."

finally ended. In 1946 the total number of communications officer and enlisted personnel unsurprisingly fell to 8,635.¹¹⁷ The Army Airways Communications System lost its independent command status, was renamed the Air Communications Service, and was assigned to the Air Transport Command. Just months later it was renamed again, this time to the Airways and Air Communications Service, using the same initials (AACS) it had previously.¹¹⁸ Somewhat ironically, the commander of the organization during these changes was none other than Major General Harold M. McClelland.¹¹⁹ McClelland was the senior communications officer during the Hap Arnold's famous Alaska flight, and he, with Arnold's blessings, was the early architect of the centrally managed communications command. Now, with the crisis of World War II gone by, McClelland was finally in command of the organization he had practically given birth to—just as it withered away.¹²⁰

In 1947 the Air Force was born, and while this did not dramatically alter the airways service, it did impose some administrative changes. One very noticeable example was the renumbering of all its wings, groups, and squadrons from one and three digit designations to the 1800 and 1900 series.¹²¹ This number scheme continued, though it added the 2000 series, up until the 1990s when communications units lost their tenant status and were renumbered to match their host wings.¹²²

The technological developments of the twenty years following World War II saw increased importance on the communications mission, and the concept of command, control, and communications (or C3) became

¹¹⁷ Baumgardner, *AACS Alumni Association*, 20.

¹¹⁸ Snyder, *Air Force Communications Command, 1938-1991*, 44.

¹¹⁹ Air Force Biography, "Harold Mark McClelland."

<http://www.af.mil/information/bios/bio.asp?bioID=6355> (accessed 24 February 2010).

¹²⁰ McClelland later served as Deputy Commander for Services, Military Air Transport Service; Director of Communications-Electronics on the Joint Staff; and after retirement as Director of Communications for the Central Intelligence Agency.

¹²¹ Snyder, *Air Force Communications Command, 1938-1991*, 47.

¹²² My first assignment, for example, was to the 1908th Communications Squadron, at England AFB, Louisiana, but it became the 23d Communications Squadron in 1991.

prominent. Martin Van Creveld describes the two decades following World War II as “the age of complexity” that saw, among other advances, the “application of electronics and automation to fire control, communications, electronic countermeasures, and logistics.”¹²³

These advances led to an increased need for both officer and enlisted specialization. “By the early 60s, most Air Force leaders accepted the idea that command, control, and communications were inseparable, and the Air Force needed to find a way to achieve a new management concept for its growing global networks, which already transcended geographic, political, and military boundaries.”¹²⁴ On 1 July 1961, on his first day as Air Force Chief of Staff, General Curtis E. LeMay redesignated the Airways and Air Communications Service as the Air Force Communications Service, elevating it to major command status and stating that the change was “in keeping with the express desires of the president for improved means effecting command and control of our forces.”¹²⁵

More importantly, this newly transformed communications command also regained centralized control over most Air Force communications systems and equipment. Air Defense Command and Strategic Air Command were notable exceptions that demanded they continue to own and control their own communications, but in the 1970s they too acceded to the communications service as the provider of command, control, and communications services.

Major General J. Francis Taylor, Jr., the Air Force Director of Command, Control, and Communications, wrote about this C3 concept

¹²³ Martin Van Creveld, *Command in War*, (Cambridge: Harvard University Press, 1985), 234-235.

¹²⁴ Larry R. Morrison, *From Flares to Satellites: A Brief History of Air Force Communications* (Scott AFB, IL: Air Force Communications Agency Office of History, 1997), 20.

¹²⁵ Louis B. Jones, “Three Decades of Air Force Communications,” *Airpower Historian* 10, no. 2 (April 1963): 57.

in 1965: “Under the command control and communications concept, communications has evolved from the status of a ‘support’ item to that of being part of the operational system.” With this emphasis on communications as part of operations, he explained that “the most modern warhead, delivery vehicle, or warning system is worthless unless it is immediately and positively responsive ... [and] this responsiveness is the essence of our communications-electronics mission today.”¹²⁶

Communications officers have long focused on communications as an operational element of the Air Force. It is almost as if being deemed a support officer is a bad thing, as support implied second-class citizenry. In effect, some would say it is just that. It is certainly true that operators—specifically pilots—run the Air Force, and that support personnel are in a very different category, but to assume this is because of the label “pilot” or “operator” is silly. It is not because they are called pilots that airplane drivers run the Air Force; it is because the Air Force is in the business of flying airplanes that pilots run the Air Force. Flying is the core mission of the service. Calling communications “operations” does not equate to flying the planes. Unfortunately many support personnel get so caught up in the labeling that they forget those labels really do signify something. This term “operator” as well as the idea of a dedicated, centralized communications command has haunted communications officers for a long time, and they will likely continue to concern them in the future.

As is frequently the case in the Air Force, however, things work in cycles. The volley back and forth between the communications service as an independent major command and as a unit reporting to another command would continue. The Air Force planned such a change in 1974. By this time the communications service, though a major command, owned only one base, Richards-Gebaur AFB, Missouri, where

¹²⁶ Taylor, J. Francis. “The Vanishing Communicator.” *Signal*, May 1965, 80.

its headquarters was located. All of the command's many other units were tenant organizations on bases owned by other major commands. Then, in an effort to reduce management costs, the Air Force announced that the communications service would move to Scott AFB, Illinois, as a technical service under the Military Airlift Command. Political pressures and environmental studies created delays, however, and the Air Force changed its plans by the time the move was completed in 1977. After moving to Scott AFB, the communications service retained its major command status, but Military Airlift Command assumed "some common, non-technical, support functions in a shared-staff arrangement."¹²⁷

Just as the command's trajectory had its ups and downs, manning within the command also varied greatly up to this period as well. In 1954 there were about 9,000 Air Force communications officers, but that dropped to about 6,000 by 1956 and, other than a Vietnam War spike, the number slowly declined until finally flattening in 1977 and remaining steady for several years at about 4,000.¹²⁸ While the Air Force faced a chronic shortage of communications officers, at least their numbers steadied. Following so many years of declining numbers, stable personnel counts were a good sign for the communications command, and another good sign soon presented itself.

On 15 November 1979, exactly 41 years after the Army Airways Communications Service was created, the Air Force Communications Service was redesignated to the more appropriate Air Force Communications Command.¹²⁹ This redesignation did not change the responsibilities or organizational structure noticeably, and is literally referenced as a footnote in the command's official history.¹³⁰

¹²⁷ Snyder, *Air Force Communications Command, 1938-1991*, 149.

¹²⁸ Morrison, *From Flares to Satellites*, 83. Numbers are estimated based on a line graph showing personnel strengths.

¹²⁹ Morrison, *From Flares to Satellites*, 48.

¹³⁰ Snyder, *Air Force Communications Command, 1938-1991*, 141.

Conclusion

The communications-electronics officer was the second evolutionary step in the evolution of the Air Force communications officer. Despite the official title, communications-electronics officers were communications officers through and through. Communications-electronics was a fanciful label that somewhat described the type of equipment communications officers were associated with, but these officers still led communications squadrons that provided Air Force wings with communications services. This epoch began with a successful communications link between an airplane in flight and a ground radio station, but while electronic technology set the stage, it was really people and their organizations that truly characterized this era.

People like Henry “Hap” Arnold, Harold McClellan, and Ivan Farman helped the Air Force create a centralized management system that eventually became Air Force Communications Service, the Air Force’s 16th major command. In 1979 the Air Force more appropriately redesignated the organization as Air Force Communications Command.

While this new name did not change the role or structure of the command, it still must have been a meaningful change to communicators. After all, even though it had technically been a major command since 1961, now everyone in the Air Force recognized the communications service as a full-blown major command. In a sense, the name change validated the communications officer: the specialization, the systems approach, and the centralized control over communications personnel and systems. Many segments of the Air Force had doubted all of these qualities, but this validation signaled future changes. Looking back, however, the name change did something else. It ushered in one challenge the Air Force and its communications officers would face in full force during the 1980s and beyond: the computer revolution.

Chapter 3

The Computer Officer

How the mighty have fallen!

King David
2 Samuel 1:19, 25, 27

In today's Air Force the communications officer and the computer systems officer are one in the same, but this has not always been the case. The widespread use of computers and the recognized benefits of automation across the service led the Air Force to develop a cadre of computer systems officers with specialized technical expertise, but the service's need to reduce personnel and costs, coupled with officer career progression concerns eventually led to career field consolidations.

The modern communications officer can be described as a hybrid of the traditional signal officer, the communications-electronics officer, the computer systems officer, the photography officer, and the administrative officer. Merging these highly specialized career fields has, in some ways, benefited the Air Force and the individual officers, but these benefits have come with a cost.

The communications officer of this epoch saw continued tension between operational and functional commanders. The question of whether communications should be aligned under local operational commanders or centrally managed and controlled by a functional headquarters plagued communications officers throughout this time period. The Air Force has reversed its position several times, sometimes allowing local commanders direct control over communications but sacrificing standardized operations and training. At other times the service has opted for centralized management, inhibiting a local wing's unity of command.

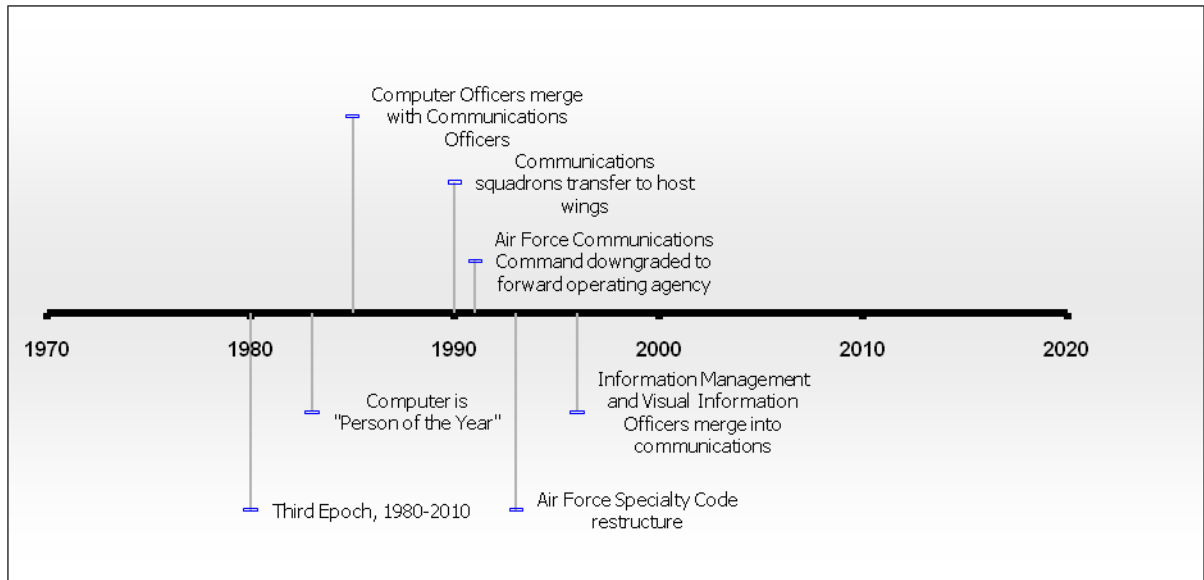


Figure 4: Third Epoch, 1980-2010

Source: Author's Original Work

Enter the Computer

In 1927 *Time* magazine inaugurated its annual *person of the year* edition by casting aviator Charles Lindbergh as the man who “for better or worse, has most influenced events in the preceding year.”¹

Unsurprisingly, the title has gone to many great, interesting, or even infamous people over the years, but the magazine did something unusual when it proclaimed: “Time's Man of the Year for 1982, the greatest influence for good or evil, is not a man at all. It is a machine: the computer.”²

The computer was not brand new in the 1980s. The abacus, dating back to ancient China, is often credited as the first computer. Charles Babbage has been called the father of computing for his designs

¹ “Heroes: Lindbergh,” *Time* 11, no. 1 (2 January 1928): <http://www.time.com/time/magazine/0,9263,7601280102,00.html>. *Time* originally used the gender-specific title “Man of the Year” until 1981, though even in this 1983 issue the magazine notes that the computer is “not a man at all.”

² Otto Friedrich, “Machine of the Year: The Computer Moves In,” *Time* 121, no. 1 (3 January 1983): 16.

of steam-powered calculating machines in the early 1800s.³ Completed in 1945, the ENIAC, or Electronic Numerical Integrator and Computer, was the first all-electronic digital computer.⁴ At that time, computers used mechanical relays that clattered away loudly like passing freight trains; however, huge, noisy computers were largely silenced by vacuum tubes in the 1950s and then miniaturized by transistors in the 1960s.⁵

Popular Electronics arguably heralded the opening of the modern computer age in its January 1975 edition's showcasing of the Altair, a kit computer that could be bought and assembled for less than \$400.⁶ Computers were no longer destined to be building- or even room-size behemoths, and they could be affordable as well. While the term *personal computer*, or PC, had yet to be coined, this artifact had indeed arrived.

The 1983 *Time* magazine explained that “the ‘information revolution’ that futurists have long predicted has arrived, bringing with it the promise of dramatic changes in the way people live and work, perhaps even in the way they think. America will never be the same.”⁷ It went on to say, “So the revolution has begun, and as usually happens with revolutions, nobody can agree on where it is going or how it will end.”⁸ The Air Force, like so many other organizations, was swept up in the uncertainty of this revolution.

Today's merged communications and computer officers began as separate and distinct specialties. Up until 1985 each evolved separately in completely different functional areas.

³ Paul Freiberger and Michael Swaine, *Fire in the Valley: The Making of the Personal Computer*, 2nd ed. (New York: McGraw-Hill, 2000), 4.

⁴ Freiberger and Swaine, *Fire in the Valley*, 8.

⁵ Freiberger and Swaine, *Fire in the Valley*, 11.

⁶ Paul E. Ceruzzi, *A History of Modern Computing*, (Cambridge: MIT Press, 1998), 226.

⁷ Friedrich, “Machine of the Year,” 14.

⁸ Friedrich, “Machine of the Year,” 24.

Air Force communications officers were born of the Army Signal Corps, and were immensely important to the Air Force's operational flying mission very early on. Initially safety was a prime consideration for being able to communicate between aircrafts or between aircrafts and ground stations, but command and control also came to rely on communications very quickly.

By 1977 the communications officer career family had been known for many years as the communication-electronics functional area, or the 30XX Air Force specialty, which had been reduced to five specialties (see Table 2).⁹

Table 2: Communications Officer Air Force Specialty Codes (AFSC), c1977

AFSC	Description
3024	Communications-Electronics Systems Officer
3034	Communications-Electronics Maintenance Officer
3016	Communications-Electronics Systems Staff Officer
3096	Communications-Electronics Director
3055	Communications-Electronics Engineer

Source: Data derived from Air Force Regulation 36-1, Officer Personnel: Officer Classification Regulation, 1 March 1977, with changes applied through Change 14, 15 September 1983.

The Air Force also included air traffic control officers as part of the communications community, even though these officers were categorized with 16XX Air Force Specialty Codes. Many communications squadrons included an air traffic control element. In fact, in reviewing official squadron histories from the 1970s, while communications squadrons provided telephone, radio, radar, weather, and navigation systems maintenance services, air traffic control was often the most visible service they provided to operational bases. Communications squadron commanders could be from either the communications-electronics or the

⁹ Air Force Regulation 36-1, *Officer Personnel: Officer Classification Regulation*, 1 March 1977, with changes applied through Change 14, 15 September 1983.

air traffic control side of the community. Air Force Communications Command owned both career areas, as well as nearly all communications units.

Air Force computer specialists, on the other hand, had an entirely different beginning. This specialty was born of the Air Force Comptroller. The Machine Accounting Officer of the 1950s became the Electronic Data Processing Officer of the 1960s. Meanwhile, the Statistical Services Officer metamorphosed to be the Data Systems and Statistics Officer of the early 1960s. Then, in 1963 these two specialties were replaced by, or merged into, the data automation officer career field, still under the Comptroller functional family.

One might wonder why the Air Force's computer expertise emerged from within the finance community. After all, computers, both hardware and software, were certainly very technical, and the finance community is not generally considered a technical career field. In truth, the Air Force just did not seem to know where to better house specialists for this blooming technological field. The communications career field certainly dealt with complex electronic systems, but computers were so specialized that each functional community basically grew its own limited specialists. Many officers across a range of different career fields found themselves "coded" with an Air Force Specialty Code prefix indicating a level of expertise with computers, and those officers frequently wound up designing and developing specialized computer systems for their own particular functional area. For example, a supply officer who demonstrated any level of computer expertise might be chosen to help develop base level supply data systems.

This diffusion of computer expertise across career fields was not accidental. While the Air Force did not really know what to do with early computer experts, the Air Staff did decide that for the time being "functional areas such as Logistics or Personnel would do their own automated systems design and be responsible for their own machine

programming of the automated systems.”¹⁰ By 1963 it seemed this responsibility would remain within the various functional areas, but a more encompassing, centralized focal point for computer expertise was needed to steer computer acquisitions and standardize system development. While supply, personnel, and communications were all possible candidates for this lead role, the finance community had the most mature computer skills.

In 1961 General LeMay issued a memorandum spelling out exactly who was responsible for “the coordination of all data systems design efforts.”¹¹ Within the Office of the Comptroller a new Assistant for Data Automation was to be stood up as the Air Force computer focal point. Even with this expanded Comptroller role, however, the Air Force remained unsure of how to hone computer expertise or how that expertise should be categorized.

At about the same time that the Air Force stood up the Assistant for Data Automation and established the data automation officer career field, both under the Comptroller, the Air Force also introduced two new officer specialties: the Computer Systems Analyst and the Computer Systems Programming Officer. Not yet specifying which career families these new career fields should belong to, each was labeled as “interim” with an explanation that “proper career area location for this utilization field has not been determined.”¹²

These changes seemed to suffice for the remainder of the 1960s, but all was not well for the Air Force and computers. On 5 January 1970 the Vice Chief of Staff formed the Air Force Select Committee on

¹⁰ *History of the Assistant for Personnel Systems*, 1 July 1962 - 30 June 1963, Vol. 5, K141.01 V.5., unnumbered page; first paragraph begins “In accordance with...”

¹¹ General Curtis E. LeMay, Vice Chief of Staff, United States Air Force, to listed commands, subject: Focal Point for Data Automation, 5 June 1961 in *Air Force Study of Air Force Organizational Ability to Exploit and Manage Computer Technology*, 1970, Appendix 1, Air University Library 358.61 U581a.

¹² Air Force Manual 36-1, *Officer Personnel: Officer Classification Manual*, 15 April 1963, with changes applied through Change 36-1V, 6 November 1968.

Computer Technology Potential, a group formed to determine how the Air Force could better manage computer resources and maximize the benefit of computer technology.¹³ The committee reported that Air Force personnel dealing with computers did not know where to turn to for advice, support, and assistance, and that the service needed expert technical assistance. It cited education, training, assignment, progression, and retention of both military and civilian personnel in the computer area as significant problems, as well as “a shortage of educated and trained computer people assigned to the functional areas.”¹⁴ The findings did not stop there, however. The report suggested a new officer career field dedicated to computers would be valuable, but it also recognized the career limitations inherent in such a move. The report postulated that the Air Force would truly benefit from such a career field only “when specialists do not have to seek other career areas to find progression possibilities.”¹⁵ In a nutshell, the committee found that in order to benefit from computer technologies, the Air Force needed to better develop and maintain an “in-house capability.”¹⁶ The Air Force agreed—it needed officers who were true computer specialists.

On 31 August 1970 the data automation officers and the new interim career fields came together as a new Computer Technology career area with an Air Force career area designator of 51XX and consisting of five specialties.¹⁷ The 1977 officer classification manual renamed the career area Computer Systems and listed eight distinct specialties under the 51XX family (see Table 3).¹⁸ Although the Comptroller still oversaw

¹³ *Air Force Study of Air Force Organizational Ability to Exploit and Manage Computer Technology*, 1970, Air University Library 358.61 U581a, Part 1, 1.

¹⁴ *Air Force Study of Air Force Organizational*, Part 1, 16.

¹⁵ *Air Force Study of Air Force Organizational*, Part 3, 10.

¹⁶ *Air Force Study of Air Force Organizational*, Part 1, 16.

¹⁷ Air Force Recurring Publication 36-1, *Air Force Officers' Career Newsletter*, Vol. 3, No. 4, July-August 1970, 2.

¹⁸ Air Force Regulation 36-1, *Officer Personnel: Officer Classification Regulation*, 1 March 1977, with changes applied through Change 14, 15 September 1983.

this new career field, the Air Force considered it a specialty unto itself. While many in the Air Force still referred to computer specialists as data automation officers, the Air Force had a maturing officer career field for computer professionals. Then, in the 1980s, the communications community assimilated this career field.

Table 3: Computer Systems Officer Air Force Specialty Codes (AFSC), c1977

AFSC	Description
5166	Computer Systems Staff Officer
5164	Computer Systems Plans and Programs Officer
5155	Computer Operations Officer
5135A	Computer Systems Development Officer, Basic Software
5135B	Computer Systems Development Officer, Applications Software
5135C	Computer Systems Development Officer, Database Administration
5135D	Computer Systems Development Officer, Computer Mathematics
5135E	Computer Systems Development Officer, Performance Evaluation

Source: Data derived from Air Force Regulation 36-1, Officer Personnel: Officer Classification Regulation, 1 March 1977, with changes applied through Change 14, 15 September 1983.

On 30 April 1985 the communications-electronics and computer systems officer career fields merged into the information systems career field with an Air Force specialty designator of 49XX.¹⁹ This was not a quick change that happened over night, though; this combining of career fields started several years before at the highest levels of the Air Force.

As a result of a 1982 Air Staff study that concluded the Air Force was no longer leading in the information technology realm, Air Force Chief of Staff General Charles A. Gabriel directed the integration of Air Force communications and data automation.²⁰ The Air Force established

¹⁹ Air Force Recurring Publication 36-1, *Officers' Career Newsletter*, Vol. 18, No. 3, Summer 1985, 2.

²⁰ Thomas S. Snyder, *Air Force Communications Command, 1938-1986: An Illustrated History* (Air Force Communications Command Office of History: Scott Air Force Base, IL, 1986), 192.

an Assistant Chief of Staff for Information Systems and planned to transfer data automation equipment and personnel across the Air Force to Air Force Communications Command. News releases explained that “standard base-level data automation units, presently a Comptroller function, will initially be organizationally realigned with base-level communications units ... forming information systems groups or squadrons.”²¹

As a result of the merger, Air Force Communications Command established its first new wings since 1957 at Offutt AFB, Elmendorf AFB, Sembach AB, Torrejon AB, and RAF Mildenhall.²² While the communications command did not change its name, its subordinate units and divisions changed from *communications* to *information systems*. Interestingly enough, the command adopted this new naming convention, in part, to avoid creating the impression that the communications community was “taking over” the data automation community.²³

After transferring data automation personnel and equipment transferred to Air Force Communications Command, the command next needed to merge career fields. First up was the officers, and on 30 April 1985 the eight 51XX computer systems officer specialties joined with the five 30XX communications-electronics officer specialties to form six 49XX *information systems officer* specialties, comprising the largest non-rated officer career field in the Air Force.²⁴

For the officers involved, there were two major benefits associated with this merger. First, the merger offered computer specialists increased leadership opportunities. These officers had rarely had the

²¹ Message, KSA/3097, Headquarters Tactical Communications Division, to 1913th Communications Group, subject: Communications and Data Merger, 25 June 1984.

²² Snyder, *Air Force Communications Command, 1938-1986*, 196.

²³ *History of the Air Force Communications Command*, 1 January – 31 December 1986, Vol. 1, Air Force Historical Research Agency Call No. K380.01 V.1, 22.

²⁴ Snyder, *Air Force Communications Command, 1938-1986*, 199.

opportunity to command a squadron prior to the merger, but now they could presumably command any communications unit. A second benefit felt across the combined career field, however, was a larger pool of interchangeable officers. Both career fields were traditionally undermanned before the merger, but with the merger some positions were consolidated, therefore decreasing the number of officers needed. This did not solve all manning problems, but it did make them more manageable.

The most noticeable change at the base level was a substantial increase in personnel and the ownership of comptroller computers. One communications squadron reported that “the upcoming integration of [data automation] will add an additional 26 personnel to the squadron. There will be 18 enlisted, one officer, and five civilians added to our squadron. One Burroughs 3700 Central Processing Unit (CPU), one Sperry 1100/60 CPU and associated hardware and software, and 48 terminals will also be added to the inventory effective 1 Jul 84.”²⁵ This was a substantial increase since the squadron had about 130 enlisted and 5 officers assigned before the merger.²⁶

Interestingly, the focus on *information systems* proved to be temporary. In 1986 the career field was renamed to cast officers as *communications-computer officers*, or, less formally, simply as communications officers, and the Air Force once again designated its information systems units as communications units.²⁷ Six communications-computers officer specialties now replaced the previous 13 computer systems and communications-electronics officer specialties (see Table 4), and they all fell under the functional control of the Air

²⁵ *1908th Communications Squadron Official History*, Air Force Historical Research Agency Call No. K381.2133 Vol. 14, 1 January-31 December 1984.

²⁶ *1908th Communications Squadron Official History*, Air Force Historical Research Agency Call No. K381.2133 Vol. 14, 1 January-31 Dec 1984.

²⁷ *History of the Air Force Communications Command*, 1 January – 31 December 1986, Vol. 1, Air Force Historical Research Agency Call No. K380.01 V.1 Jan-Dec 1986, 23.

Force Communications Command.²⁸ Although some officer in this new career area came from comptroller and computer origins, they were all communications officers now.

**Table 4: Communications-Computers Officer
Air Force Specialty Codes (AFSC), c1986**

AFSC	Description
4996	Communications-Computer Systems Director
4916	Communications-Computer Systems Staff Officer
4945A	Communications-Computer Systems Officer, Operations
4945B	Communications-Computer Systems Officer, Maintenance
4925	Communications-Computer Systems Programming and Analysis Officer
4935	Communications-Computer Systems Engineer

Source: Data derived from Air Force Regulation 36-1, Officer Personnel: Officer Classification, 1 January 1984, with changes applied through Change 10, 15 September 1988.

Communications officers and their major command reached a high point in the mid- to late-1980s. In September 1985 the Air Force Chief of Staff acknowledged the command's increased responsibilities by upgrading its two-star general commander's billet to a three-star position.²⁹ By 1986 the Air Force Communications Command was the Air Force's most widely dispersed command with over 60,000 officer, enlisted, and civilian personnel assigned to 743 units at over 450 locations.³⁰ The command already centrally managed the service's communications and air traffic control services, and recently added computer systems to its portfolio. Air Force Communications Command and communications officers had reached their pinnacle, but their success was short-lived.

²⁸ Air Force Regulation 36-1, *Officer Personnel: Officer Classification*, 1 January 1984, with changes applied through Change 10, 15 September 1988.

²⁹ Thomas S. Snyder, *Air Force Communications Command, 1938-1991: An Illustrated History* (Air Force Communications Command Office of History: Scott Air Force Base, IL, 1991), 196. The commander continued to be a two-star general, however, due to the Congressional cap on the number of three-star generals.

³⁰ Snyder, *Air Force Communications Command, 1938-1986*, 190.

On 19 June 1989 the Commander-in-Chief of Pacific Air Forces, General Merrill A. McPeak, submitted a formal program change request to Headquarters Air Force asking that communications units on his bases be assigned to his command.³¹ He asserted that Air Force Communications Command was not needed, and that communications and computer systems and personnel should be aligned under mission commanders, not a functional command.

On 30 August 1989 Air Force Chief of Staff Larry D. Welch created a panel to consider Air Force Communications Command's future.³² In September, after considering options such as eliminating the command entirely or merging it with Electronics Security Command, the panel recommended against restructuring the command because the command's own internal streamlining efforts were satisfactory. Air Force Communications Command escaped the knife, but only momentarily.

Despite the panel's recommendations, on 18 June 1990 General Welch announced a "complete restructure of Air Force communications and computers" effective 1 October 1990.³³ Two of his main objectives were to strengthen the unity of command for operational commanders and to ensure a responsive, enforceable structure for operations, maintenance, and interoperability of communications and computer systems.³⁴ Under this restructuring Air Force Communications Command would still plan many aspects of communications and computer systems, but the Air Force transferred most communications units to their host wings and major commands. While retaining its

³¹ Snyder, *Air Force Communications Command, 1938-1991*, 260.

³² Snyder, *Air Force Communications Command, 1938-1991*, 260.

³³ General Larry D. Welch, Chief of Staff, United States Air Force, to All Major Command and Separate Operating Agency Commanders, Subject: Air Force Communications and Computer Restructure Memorandum, 18 June 1990 in *History of the Air Force Communications Command*, 1 January - 31 December 1990, Vol. 2, Air Force Historical Research Agency Call No. K380.01 V.1 Jan-Dec 1990, I-2-1.

³⁴ Snyder, *Air Force Communications Command, 1938-1991*, 261.

major command status, Air Force Communications Command shrank to less than 8,000 people.³⁵

Why, after developing a successful centralized management approach for communications, did the Air Force abruptly change directions and decentralize communications and computers when even its own studies showed the current system was adequate? Two main factors that need to be understood in order to better understand why General Welch ordered such a change. The first factor was world events. The second was the ongoing debate between centralized control and unity of command.

The end of the Cold War served as the backdrop for General Welch's 1990 order to reorganize Air Force communications.³⁶ With no Cold War threat looming, America was reducing its defense spending and drawing down its military. In 1986 the Air Force had 603,373 active duty personnel, but by 1988 it was down to 571,648 and still dropping.³⁷ With such drastic cuts to personnel, the Air Force needed to consolidate or streamline missions where it could. To many it must have seemed that Air Force Communications Command was an additional bureaucratic headquarters that could be cut or eliminated without jeopardizing operational missions. At the same time, with the deployment of forces to the Middle East for Operation Desert Shield, the Air Force needed robust, responsive communications that answered to operational mission commanders.

General McPeak had voiced a concern that other operational commanders echoed: communications units should fall under and answer to their host wings. As tenant organizations, communications units were outside the normal chain of command on a base. Many

³⁵ Snyder, *Air Force Communications Command, 1938-1991*, 261.

³⁶ History of the Air Force Communications Command, 1 January – 31 December 1991, Vol. 1, Air Force Historical Research Agency Call No. K380.01 V.1 Jan-Dec 1991, 1.

³⁷ Bruce Rolfson, "Drawdown: Force to be Cut by 6,000 Airmen," *Air Force Times*, 5 April 2010, 21.

mission commanders were dissatisfied with the level of service provided by their local communications units, and these mission commanders had no direct means of dealing with the situation.

In general, communications squadrons were under the operational control of the local wing commander, but they were under the administrative control of Air Force Communications Command. This meant the communications squadron commander interacted with the local wing commander and tried to meet the wing's needs, but the communications squadron commander was still bound by Air Force Communications Command policies and procedures. Further, the communications squadron commander's performance evaluations and promotion recommendations were written not by the local wing commander, but by Air Force Communications Command in their administrative chain of command.

While this command structure made it clear that a communications squadron existed to serve its host wing with a service, it was just as clear that the communications command, and not the wing commander, judged the communications squadron commander's performance and effectiveness. The communications squadron commander might even call the wing commander *boss*, but if push came to shove, a career-minded communications officer knew that it was Air Force Communications Command, and not the local wing commander, that had to be made happy.

The 1990 communications reorganization completely changed the command relationship between the communications squadron commander and the local wing commander. The change placed the wing commander completely in charge. Correspondence of the day reveals the impact this change had upon communications officers.

As just one such example, Brigadier General Bruce J. Bohn, the Commander of the Tactical Communications Division under Air Force Communications Command, wrote to Tactical Air Command wing

commanders on behalf of communications squadrons. He wrote to 23d Tactical Fighter Wing commander Brigadier General David A. Sawyer at England AFB, Louisiana, "Even though the [1908th Communications Squadron] has always worked for you, there will be apprehension and uncertainty as to what the future will be like with a new senior rater..."³⁸

Likewise, General Bohn wrote to the communications squadron commanders to advise them regarding the chain of command changes. In a memorandum to 1908th Communications Squadron commander Lieutenant Colonel Richard Mackey, General Bohn advised Colonel Mackey to spend time with the wing commander and to "create opportunities for [communications officers] to be visible to their senior rater so when it comes [promotion recommendation form] time, they will compete favorably."³⁹

On 1 October 1990 the 1908th Communications Squadron became the 23d Communications Squadron as it transferred from Tactical Communications Division under Air Force Communications Command to the 23d Tactical Fighter Wing under Tactical Air Command.⁴⁰ Similar changes happened to communications squadrons across the Air Force. Communications personnel of all ranks were unsure of exactly how they would be viewed by their new bosses, and while affected individuals raised many questions and concerns, they were particularly worried about promotions, assignments, and professional military education

³⁸ Brigadier General Bruce J. Bohn, Deputy Chief of Staff for Communications-Computer Systems, Tactical Air Command, to 23d Tactical Fighter Wing Commander, Subject: Communications-Computer Systems Restructure Memorandum, 17 September 1990 in *1908th Communications Squadron Official History*, 1 January - 30 September 1990, Air Force Historical Research Agency Call No. K383.01-1908 Jan-Dec 1990, 39.

³⁹ Brigadier General Bruce J. Bohn, Commander, Tactical Communications Division, to 1908th Communications Squadron Commander, Subject: Communications-Computer Systems Restructure Memorandum, 27 September 1990 in *1908th Communications Squadron Official History*, 1 January - 30 September 1990, K383.01-1908 Jan-Dec 1990, 40 (underlined words were underlined in original memorandum).

⁴⁰ Tactical Air Command Special Order GB-45, 27 September 1990 in *1908th Communications Squadron Official History*, 1 January - 30 September 1990, Air Force Historical Research Agency Call No. K383.01-1908 Jan-Dec 1990, no page number.

opportunities.⁴¹ The angst many communications officers felt was understandable, and at first many communications professionals believed—or at least hoped—that the change would be short-lived and that communications squadrons would revert to Air Force Communications Command. Other Air Force organizational changes, however, soon made such a reversal impossible.

Air Force Communications Command lost further stature when Air Force Chief of Staff General Merrill A. McPeak converted it from a major command to a field operating agency reporting to the Deputy Chief of Staff for Command, Control, Communications, and Computers on 1 July 1991.⁴² Soon after it was redesignated the Air Force Command, Control, Communications, and Computers Agency, and it was reduced to about 900 people.⁴³ The commander's billet, officially a three-star general's position though it had never been occupied by an officer higher than a two-star general, was downgraded to that of a colonel.

The disbandment of Air Force Communications Command made it clear that communications squadrons really were part of the host wing's structure and that communications officers really did work for the wing commander.

The early 1990s were difficult times for the communications community. While relinquishing its major command status as well as direct ownership of communications units, personnel, and equipment, air traffic control operations were also stripped from the communications community. Another field operating agency, the Air Force Flight Standards Agency, was established on 1 October 1990 to fill the air

⁴¹ *1908th Communications Squadron Official History*, 1 January - 30 September 1990, Air Force Historical Research Agency Call No. K383.01-1908 January-December 1990, no page number.

⁴² Snyder, *Air Force Communications Command, 1938-1991*, 261.

⁴³ *History of the Air Force Command, Control, Communications, and Computer Agency*, 1 January 1994 - 31 December 1995, Air Force Historical Research Agency Call No. K380.01 V.7 January 1994-December 1995, I-181-10.

traffic role.⁴⁴ Further, the Air Force removed air traffic controllers from communications squadrons and deposited instead into newly established operations support squadrons. The communications world was getting smaller and smaller.

The Air Force restructured its entire Air Force Specialty Code system of military personnel classification in 1993. While this restructuring had broad and far-reaching implications for many career fields, the communications-computer officer specialty was noticeably switched from 49XX to 33SX. Individual duty titles and descriptions were not significantly altered, though the Air Force eliminated specific specialty codes for communications staff officers. Instead, whether an officer served in a base-level or higher-headquarters position would simply be indicated by the fourth character of the specialty code (33S3 or 33S4, respectively). Otherwise these base-level and higher-headquarters positions could be completely interchangeable, not requiring any specialized training or experience, and therefore further generalizing the communications officer career field.

In 1996, however, the service merged nearly 1,500 officers in the information management and visual information career areas into communications-computers.⁴⁵ All were now part of the 33SX career family, and the specialty area's title officially became *communications and information* in recognition of the change (see Table 5), though these officers were still referred to simply as communications officers in informal settings. There was also talk of renaming *communications squadrons* to *communications and information squadrons*, but that decision was pushed back until it was eventually forgotten. The Air Force Command, Control, Communications, and Computers Agency

⁴⁴ Air Force Standards Agency Fact Sheet, Air Force Historical Research Agency, <http://www.afhra.af.mil/factsheets/factsheet.asp?id=14010> (accessed 14 March 2010).

⁴⁵ Larry R. Morrison, *From Flares to Satellites: A Brief History of Air Force Communications* (Scott AFB, IL: Air Force Communications Agency Office of History, 1997), 71.

leaders at the time joked that the agency would never be called the CIA—Communications and Information Agency—but it did become the Air Force Communications Agency in supposed recognition of the merger.

**Table 5: Communications and Information
Officer Air Force Specialty Codes (AFSC), c1996**

Prior to 1996 Merger		After 1996 Merger	
AFSC	Description	AFSC	Description
33SX	Communications-Computer Systems Officer	33SX	Communications and Information Officer
33SXA	Communications-Computer Systems Officer, Electrical Engineer	33SXA	Communications and Information Officer, Electrical Engineer
33SXB	Communications-Computer Systems Officer, Software Engineer	33SXB	Communications and Information Officer, Software Engineer
33SXC	Communications-Computer Systems Officer, Software Programmer/Analyst	33SXC	Communications and Information Officer, Software Programmer/Analyst
37XX	Information Management Officer		
33VX	Visual Information Officer		

Source: Data derived from Air Force Manual 36-2105, Personnel: Officer Classification, 31 October 1995 and Air Force Manual 36-2105, Personnel: Officer Classification, 31 October 1998.

One must consider several aspects of this merger to better appreciate its ramifications. First, while termed a *merger*, for many people it looked like the communications community merely swallowed up the other two specialties. For specialty coding, that observation certainly seems accurate. Previous career field mergers generally eliminated two or more different career field areas and created in their place a new career field that combined the old ones, such as when the 30XX family of communications merged with the 51XX family of computer systems, forming the 49XX communications-computer career area. In this case, however, the 33VX and 37AX career areas

disappeared, but the 33SX career area stayed. No new career area was created; instead the 33SX career area kept the same designator, though the Air Force altered its description to reflect the addition of 33VX and 37AX responsibilities.

Despite appearances, the service reassured the affected personnel that this was a merger, or even a reengineering effort, but not a takeover of the information management and visual information career fields. Still, many officers in those two career fields felt like they were becoming communications officers—not like their career field was being merged with communications. Even official correspondence regarding the merger sometimes referenced “the assimilation of [information management] resources into the [communications] community.”⁴⁶

The general perception that communications merely swallowed up information management and visual information discounts the wide variety of differences between the specialties and underestimates the effects of the merger on the communications officer. As noted, the communications officer evolved from a technical specialty that ranged from visual signaling techniques to electronic devices like the telephone, radio, radar, and finally the computer. The visual information officer emerged from audio-visual specialties, most especially photography, but also had roots in motion picture development, television production, and cartography. Just as notable, several mergers involving administrative support officers, executive support officers, and adjutants produced the information management officer.

At first blush it may seem like communications had taken on less technical career fields, increased its manpower pool, and saw no

⁴⁶ Colonel James G. Nicholas, Vice Commander, Air Force Command, Control, Communications, and Computer Agency, to Major Vaughn, HQ USAF/SCX, Subject: Organizational Review of Command, Control, Computers, and Communications (SC) and Information Management (IM) Memorandum, 10 January 1994 in *History of the Air Force Command, Control, Communications, and Computer Agency*, 1 January 1994 - 31 December 1995, Air Force Historical Research Agency Call No. K380.01 V.6 January 1994-December 1995, I-186-1.

downside while visual information officers and information management officers were expected to become technically proficient in communications and computers. Traditional communications officers also faced challenges, however.

Visual information officers and information management officers had diverse responsibilities very unlike traditional communications roles. Visual information included photography and graphic art, which meant responsibilities for operating the base photo lab, crime scene and aerial photography missions, photography for high visibility ceremonies, and developing graphic art for posters and signs. Likewise, information managers were responsible for base forms and publications libraries, postal and base distribution functions, administrative support, and executive officer duties.

The argument to combine these specialties may seem alluring at first. After all, graphic artists were increasingly using computers to generate art, photography was being digitized, and publications were increasingly distributed in electronic form. Traditional administrative functions became less about typewriters and filing cabinets and more about computers and data management. It made sense for the Air Force to recognize these changes and adapt to them, but it seems the Air Force took the extreme position that anything done on a computer should be done by the communications officer. Equating radios and computers with graphic art and administration functions created a generalist career field with no real specialty.

Communications officers were now in charge of filling Freedom of Information Act requests, producing installation decals, creating signage for official functions, photographing events, acting as executive officers and administrative assistants to Air Force leaders across any number of functional areas, as well as overseeing the traditional communications and computer systems operations and maintenance missions. In effect,

the communications officer became a jack-of-all-trades, but a master of none.

While this merger diluted the technical aspects of the communications officer career field, three sub-specialties, or shredouts, still required technical expertise: electrical engineer, software engineer, and computer programmer/analyst. While exact personnel counts varied, one snapshot of those numbers reported that of 4,648 communications officers, 318 were electrical engineers, 97 were software engineers, and 1,282 were programmer/analysts.⁴⁷ These numbers indicate that broad-based generalists comprised about two thirds of all communications officers, while only about one third of the career field were specialists focusing on specific mission areas.

In 1998, however, the Air Force eliminated two of these shredout specialties.⁴⁸ Software engineers and the programmer/analysts were absorbed into the core communications officer field, leaving only the electrical engineer as a specialized segment of the communications officer family. Most communications officers were now officially interchangeable, and leaders seemed to focus on broadening and career development over specialization and technical expertise.

This affinity for generalization was explicit. As an example, a 1994 Air Force Materiel Command communications officer career development plan warned, “A word of caution on specialization to the specialists—the Air Force needs technical specialists, but that need is limited.” It went on to explain that specialization could “erode senior leadership's confidence in an officer's ability and flexibility ... [impacting] ... continued promotion at the field grade level where requirements for highly

⁴⁷ Dina G. Levy, Harry J. Thie, Albert A. Robbert, Scott Naftel, Charles Cannon, Rudolph H. Ehrenberg, Matthew Gershwin, *Characterizing the Future Defense Workforce* (Santa Monica: Rand, 2001), 150.

⁴⁸ Air Force Manual 36-2105, *Personnel: Officer Classification*, 31 October 1998, 9.

specialized and narrowly focused majors and lieutenant colonels are fewer.”⁴⁹

Similarly, a 1999 communications officer professional development guide produced by the Air Staff said that professional development required a “balanced approach in expertise—fixed communications, tactical communications, operational deployments, project management, maintenance, acquisition, architectures, budget, etc. are examples of expertise; officers need experience in a variety of these, not narrow specialization.”⁵⁰ This document also sent a clear signal that for officers to be promoted “a broad spectrum of diversified jobs creates the best promotion recommendation form.”⁵¹ Further, it explained that the initial Basic Communications Officer Training course was not the specialized training of generations past; its primary focus was “to provide a broad brush of basic communications fundamentals.”⁵² The Air Force appeared to be trying to eliminate the communications officer’s role as a technical specialist.

Why did the Air Force continue to make the communications officer a less and less technical career field? The answer may lie in the question of promotions and retention of Air Force communications officers. During its existence, Air Force Communications Command tended to have “well qualified and highly effective” officers who “managed complex systems vital to national defense, but for some reason this quality was not reflected in the promotion rates” which were typically

⁴⁹ *Air Force Materiel Command (AFMC) Communications-Computer Systems Officer (33SX AFSC) Visual Information Officer (33VX AFSC) Career Development Plan (CDP)*, 1 October 1994, 4.

⁵⁰ *Communications and Information Career Field Officer Professional Development Guide* (undated but distributed by AFPC on behalf of Air Staff on 23 Jul 1999), 5.

⁵¹ *Communications and Information Career Field*, 18.

⁵² *Communications and Information Career Field*, 20.

below the Air Force average.⁵³ Even though the major command was now gone, the junior officers who had grown up in that time believed the service overlooked technical officers when it came to promotions. It stands to reason that those officers were now the senior communications officers shaping the career field, and they generally saw more value stressing broad management and leadership experience over specialized technical skills.

A 1976 Rand study supports this interpretation. It noted several reasons for the Air Force's frequent inability to capitalize on its computer expertise:⁵⁴ First, many decision makers lacked the computer systems experience needed to understand the consequences of their decisions regarding those systems. Second, assignments frequently moved people to new assignments unrelated to their previous ones, an obstacle to building in-depth experience and corporate knowledge. Third, voluntary separation rates for field-grade computer systems officers were significantly higher than those for field-grade personnel in general, though this phenomenon was also apparent in other highly specialized career fields. Finally, field-grade officers in other career fields, such as logistics or maintenance, frequently avoided having computer experience identified in their personnel records since they feared it might narrow their career opportunities.

Field-grade officers generally perceived that that specialization was bad for their careers according to this Rand study. Computer systems officers, as well as other officers who showed a technical proficiency, felt their chances of promotion were lower than that of more generalized officers. While the study did not make specific recommendations as to how to mitigate these problems, it makes sense that one possible course

⁵³ History of the Air Force Communications Command, 1 January – 31 December 1984, Vol. 1, Air Force Historical Research Agency Call No. K380.01 V.1 January-December 1984, 51.

⁵⁴ S.M. Drezner, *The Computer Resources Management Study*, (Santa Monica: Rand, 1976), 19.

of action would be to transition to a broader, more generalized career path for these technical career fields, and over time, that is exactly what happened.

While merging career fields into more generalized, less technical ones may well have addressed some of the issues identified regarding office career progression, these same steps logically also compounded the corporate problems of inexperienced officers with frequent reassignments to jobs unrelated to previous ones.

Interestingly, a 2005 Rand study noted a similar problem in a distinct shortage of captains and field-grade officers in the communications and information career field, but this study suggested the career field's diversity, or generalization, was a source of the problem.⁵⁵ Without recommending specific solutions for the imbalance between requirements and available officers, the study suggested that segmenting the career field into more distinct specialties would improve the career field's overall health.⁵⁶ Generalization has created its own set of problems, and it appears that specialization is at least one means of addressing them.

Conclusion

The computer officer was the third evolutionary stage in the evolution of the communications officer. During this epoch communications-electronics officers that had specialized in radio and radar and the like were combined with computer systems officers that had specialized in accounting systems and data automation, becoming first information systems officers and then communications-computer officers. Continuing the generalization trend, information management officers specializing in administration and executive support and visual information officers specializing in photography and graphics joined the

⁵⁵ Lionel A. Galway, *Understrength Air Force Officer Career Fields: A Force Management Approach* (Santa Monica: Rand, 2005), 42-47.

⁵⁶ Galway, *Understrength Air Force Officer Career Fields*, 45.

career field, thus creating the communications and information officer. This title, like those of the communications-electronics officer, communications-computer officer, and information systems officer, was a temporary label applied to communications officers that the wider Air Force community ignored. Regardless of official labels, the product of these mergers was a generalist communications officer who had responsibilities across many different areas, but specialized in none of them.

The communications officer produced by the Air Force during this period sought relevancy and efficiency at the cost of the technical knowledge and expertise. The gluttony of generalization created the largest support officer career field, with each officer meant to be interchangeable. The time of specialized communications officers had past; however, many hoped that a foray into cyberspace might force a return to specialization.

Chapter 4

The Cyberspace Officer

Only by strict specialization can the scientific worker become fully conscious, for once and perhaps never again in his lifetime, that he has achieved something that will endure. A really definitive and good accomplishment is today always a specialized act.

Max Weber

William Gibson coined the term *cyberspace* and then popularized it in his 1984 novel *Neuromancer*.¹ While Gibson's description of the computer-based virtual domain as a "consensual hallucination experienced daily by billions of legitimate operators, in every nation" may not reflect our current understanding of cyberspace, his name for the domain stuck.² To the American military cyberspace became a warfighting domain, and the Air Force eventually became determined to fly and fight in that domain.

By the 1990s cyberspace had picked up steam, although the Air Force was unsure of its role at first. A 1993 Rand journal article warned, "Cyberwar is Coming!" and that *netwar* would span across economic, political, social, and military boundaries.³ Communications and information systems were clearly important in this new form of warfare, but the role of the Air Force in future battles was less comprehensible. Against a regional aggressor, the Air Force would use the kinetic effects

¹ The term *cyberspace* was defined in and popularized by Gibson's *Neuromancer*, which is frequently cited incorrectly as the first use of the word; Gibson first published the term in the July 1982 *Omni Magazine* short story "Burning Chrome."; the Department of Defense defines cyberspace as a "global domain within the information environment consisting of the interdependent network of information technology infrastructures, including the Internet, telecommunications networks, computer systems, and embedded processors and controllers." Joint Publication 1-02, *Department of Defense Dictionary of Military and Associated Terms*, 12 April 2001 as amended through 31 October 2009, 141.

² William Gibson, *Neuromancer* (New York: Ace Books), 51.

³ John Arquilla and David Ronfeldt, "Cyberwar is Coming!" *Comparative Strategy* 12, no. 2 (April-June 1993): 144.

of airpower to eliminate the adversary's communications and logistics.⁴ Naturally, the Air Force would provide air superiority in any major conflict, but it was not expected to have a starring role in cyberspace.

The 2003 *National Security Strategy to Secure Cyberspace* made it clear that the United States saw the value and vulnerabilities of cyberspace. It called the cyberspace the "control system of our country" and explained that "cyberspace is composed of hundreds of thousands of interconnected computers, servers, routers, switches, and fiber optic cables that allow our critical infrastructures to work. Thus, the healthy functioning of cyberspace is essential to our economy and our national security."⁵ The importance of cyberspace had become apparent, and the military would be expected to protect America's vital interests in this virtual realm. The role of the Air Force, however, was still not obvious.

In recent years each of the United States military services has concentrated some level of effort on the cyberspace domain, focusing on how to best integrate cyberspace operations with its own unique roles and missions. The United States Air Force even went so far as to release a new mission statement in 2005 that states: "The mission of the United States Air Force is to deliver sovereign options for the defense of the United States of America and its global interests -- to fly and fight in Air, Space, and *Cyberspace* [emphasis added]."⁶

In 2007 the Air Force renamed the Air Force Command and Control & Intelligence, Surveillance, and Reconnaissance Center as the Air Force Global Cyberspace Integration Center. This change expressed a "cultural shift throughout the Air Force following the identification of a

⁴ Arquilla and Ronfeldt, "Cyberwar is Coming!" 160.

⁵ *National Strategy to Secure Cyberspace*, vii.

⁶ Mitch Gettle, "Air Force Releases New Mission Statement," *Air Force Print News*, <http://www.af.mil/news/story.asp?storyID=123013440> (accessed 18 March 2010).

new domain of operations.”⁷ This was only one of the cyberspace-related organizational changes the Air Force envisioned, though.

Initially proposed as a major command, in 2009 the Air Force instead activated its lead cyberspace organization as Twenty-fourth Air Force, a numbered air force reporting to Air Force Space Command. Major General Richard E. Webber, the first commander of this new organization, explained its mission was to “provide combat-ready forces trained and equipped to conduct sustained cyber operations, fully integrated within air and space operations.”⁸

The Air Force clearly considered cyberspace an important domain when it altered its mission statement. The service focused on, to the point of obsession, organizational changes needed to better fly, fight, and win in cyberspace, but it also needed qualified personnel in those organizations. Although the service changed its organization, policies, and strategies to reflect technological advances in cyberspace, it lacked a dedicated a career field specialty for cyberspace. The Air Force turned to the communications community to fill that void, but the community needed different kinds of specialists for its new cyberspace responsibilities.

Several iterations of a plan to man a brand new cyberspace operations officer career field were developed by the Air Force. Early on, the service considered transferring both communications officers and electronic warfare officers into the new career field.⁹ Later iterations of the plan set aside this notion without abandoning it altogether, and instead focused on a wholesale conversion of all communications officers from the familiar 33SX career field to a new designation, 17DX, and

⁷ “History of the Global Cyberspace Integration Center Fact Sheet,” <http://www.gcic.af.mil/library/factsheets/factsheet.asp?id=7959> (accessed 1 May 2009, but no longer available at this web address).

⁸ “24th Air Force Activated, 2 Units Realign in Joint Ceremony,” 18 August 2009 <http://www.af.mil/news/story.asp?id=123163831> (accessed 18 March 2010).

⁹ Developing Cyber Warfare Professionals briefing, 2 April 2008.

possibly incorporating other personnel from the electronic warfare or other communities later. Although the service originally planned to implement the change on 31 October 2009 to coincide with a regularly scheduled update of its Air Force Officer Classification Directory, the change was delayed at the last moment until 31 October 2010.¹⁰

The Air Force accelerated its conversion plans, however, early in 2010. Lieutenant General William T. Lord, Chief of Warfighting Integration under the Secretary of the Air Force, announced the service's new plan on 27 January 2010 and the service's communications officers ceased to exist officially on 30 April 2010, exactly 25 years after the merger between communications-electronics officers and computer systems officers.¹¹ On this day, cyberspace operations officers replaced the traditional communications officers whose roots reached back to the Army Signal Corps.

The question to ask, then, is how did the Air Force automatically and magically transform all of its communications officers into cyberspace operations officers overnight? Had the service merely relabeled a career field to give it a more modern sounding title? After all, it implemented the change without imposing any additional training or experience requirements.

Further, the new 17DX cyberspace operations officer career field actually includes two specialties, or shredouts: the A shredout is cyber warfare operations and the B shredout is cyber control operations. Most of the communications officer career field responsibilities fall within the cyber control operations specialty, while the A shredout focuses on the

¹⁰ Lieutenant Colonel C.J. Sovada, "When will our AFSC change?" 33S / 17D Community of Practice post, 24 September 2009, <https://www.my.af.mil/afknprod/Forum/default.aspx?g=posts&t=80181&Filter=AF-SC-01-25> (accessed 16 April 2010).

¹¹ Lieutenant General William T. Lord, Chief of Warfighting Integration and Chief Information Officer, United States Air Force, to major command vice commanders and others, e-mail, Subject: Accelerating Conversion from 33S to 17D, 27 January 2010.

more specialized warfare aspects of cyberspace.¹² This warfare specialty will be small, and its officers will generally flow from that shredout to the more generalized cyber control operations specialty as they progress in rank, though certainly some generalists may become warfare specialists as well.¹³

The selection of 17DX to designate these two new specialties carries a distinctive cultural significance. The first character of an Air Force Specialty Code indicates a broad mission area. Any officer whose specialty begins with a 1 is considered operations, while a 3 indicates a support officer. Other designators include 2 for logistics, 4 for medical, 5 for legal and chaplain, 6 for acquisition, 7 for special investigations, 8 for special duties, and 9 for special reporting identifies. Communications officers have traditionally been considered support officers, but this new specialty code places cyberspace operators, as the title suggests, in operations.

Operators are the elite of the Air Force. This new specialty code puts cyberspace operators, and therefore communications officers, in the same prestigious category as pilots, navigators, and space and missile operators. Whether this change was warranted is debatable, but it certainly has ramifications and raises questions that the Air Force will have to address.

First, the communications officer career field was the largest, and arguably one of the most influential, in the support community. It seems unlikely that the cyberspace operator will have as much influence in the operations community. Despite operations being the elite of the Air Force, there is no mistaking that pilots lead the Air Force. Even if the

¹² Lieutenant Colonel Joseph Trechter, "Bullet Background Paper on AFSC Conversion Process," 6 January 10.

¹³ Lieutenant Colonel C.J. Sovada, "30 April 2010 AFSC Conversion," 33S / 17D Community of Practice post, 1 February 2010, <https://www.my.af.mil/afknprod/Forum/default.aspx?g=posts&t=96261&Filter=AF-SC-01-25> (accessed 16 April 2010).

cyberspace warfare mission truly is on par with other operational missions, it encompasses such a small specialized segment of cyberspace operations—just those in the A shredout—that very few communications officers will ever have a direct role in it.

Second, organizationally, communications officers have characteristically led communications squadrons, and communications squadrons are support units. On almost any Air Force installation, the communications squadron is assigned to the mission support group, as are the force support, civil engineer, security forces, contracting, and logistics readiness squadrons. These support organizations are all typically headed by support officers, but an operator will now lead communications squadrons in their support mission.

Despite the supposed change for communications officers, no mission change has been proposed for communications squadrons; no plans published to redesignate those squadrons as anything other than the support units they are. Cyberspace operations officers will continue to lead these squadrons, but if the role of the officers has changed, how can the squadrons they belong to and lead have stayed the same? If the squadron continues to do the same support job, how can we pretend the role of the squadron's leader is somehow different?

Third, even if a small number of communications officers really are called upon to perform an operational cyberspace mission, that does not mean the entire career field should be redesignated as operations. In comparable cases, small numbers of communications officers have frequently been assigned to or led postal squadrons and intelligence support squadrons. These communications officers were not, however, redesignated as postal officers or intelligence officers, nor were they categorized as special duty officers or operators.¹⁴ They were simply

¹⁴ Postal is a special duty career field for enlisted personnel designated by the 8MXXX specialty code, but falls under communications for officers. The intelligence officer specialty code is 14NX, categorized as operations, but communications officers retained

communications officers doing a less traditional—but no less vital—communications mission.

So now cyberspace operations officers are responsible for a diverse range of areas that include publications and forms, information management, Freedom of Information Act requests, postal operations, radar maintenance, telephone maintenance, and computer network support. Are these varied administrative, maintenance, and support activities really considered cyberspace operations? The answer is a resounding no.

To some this specialty code change culminates a transformation begun in 2005 when the Air Force boldly announced that it would fly and fight in air, space, and cyberspace. Other than a very small percentage of cyberspace operations officers who will be flagged as cyber warfare specialists, however, there appears to be no changes in duties performed by this career field, making the name change from communications to cyberspace operations seem anticlimactic and possibly even disingenuous.

Initially this may seem to be the case, but the career field's conversion was the initial step, and a fragile one at that, in the service's plan to develop a cyberspace professional corps. Beyond the simple relabeling of communications officers as cyberspace operators, the Air Force is placing a strong emphasis on education and training for the new career field.

The Air Force lowered the communications officer career field's technical education requirements in the 1990s when it folded in the visual information and information management officer career fields. During this period the Basic Communications Officer Training course that provided initial technical training for new communications officers also became less technical, focusing instead on providing a "broad brush

their 33SX designator and have not been considered operators when assigned to intelligence missions.

of basic communications fundamentals.”¹⁵ The service, however, seems to be reversing these trends.

The Air Force has increased the academic requirements necessary for new accessions to join the cyberspace operations career field. Candidates are required to have, as a minimum, an undergraduate degree in computer science; cyberspace security; electrical, computer, or systems engineering; physics; mathematics; information systems; or information security/assurance.¹⁶

Indicative of the types of jobs officers in the career field were expected to perform, previous requirements were far less technical. In fact, despite assumptions that the communications officer career field was very technical, it is telling that the Air Force itself categorized it as non-technical.¹⁷ Prior to the development of the new cyberspace operations career field, the Air Force only required its communications officers to have 24 credit hours of information technology or mathematics related courses.¹⁸ Even that nominal requirement was a fairly recent change; in 1998 only 12 credit hours of information technology were required to join the career field.¹⁹ This renewed focus on educational requirements for the new cyberspace career field is clearly a step in the right direction. Education, however, is not the only important factor in developing cyberspace operations officers; they must also be trained.

¹⁵ *Communications and Information Career Field Officer Professional Development Guide* (undated but distributed by AFPC on behalf of Air Staff on 23 Jul 1999), 20.

¹⁶ *Air Force Officer Classification Directory*, 30 April 2010, 74.

¹⁷ *Air Force Officer Opportunities*, <http://www.airforce.com/opportunities/officer/careers/> (accessed 25 March 2010); apparently the Air Force categorized the career field as non-technical because a technical degree was not required for entry into it. The Air Force generally considers science and engineering degrees technical, though it considers computer science degrees non-technical. Computer engineering is a technical degree.

¹⁸ *Air Force Officer Classification Directory*, 31 January 2008, 86.

¹⁹ Air Force Manual 36-2105, *Personnel: Officer Classification*, 31 October 1998, 117; with the notable exception of the A-Electrical Engineer shredout which required undergraduate academic specialization in electrical engineering.

Education builds a foundation that prepares officers to deal with future challenges, but training provides proficiency to use technology and operate current tools.²⁰ The Air Force is developing a 115-day Undergraduate Cyber Training course at Keesler AFB that new officers entering the cyberspace operations career field will attend.²¹ Although the service automatically converted its existing communications officers to basic-level cyberspace operators, these officers must complete additional training to regain their previous skill level status as depicted by their occupational duty badge. In short, officers who have earned the senior or master level communications badge must complete the Cyberspace Operations Transition Course to wear the same level cyberspace badge.²² This course, more commonly referred to as the *X-Course*, is an online computer-based training program expected to take up to 30 days to complete.²³ Both the new Undergraduate Cyber Training Course and the Cyberspace Operations Transition Course show that the Air Force is serious about creating a cadre of specialized cyberspace operators. As important as education and training will be in developing that cadre, however, the service will also need to change its mindset concerning cyberspace operations career field expectations to capitalize on its investment in education and training.

The Air Force clearly plans for its cyberspace career field to specialize more than its communications officer generalists did. According to the *Air Force Roadmap for the Development of Cyberspace Professionals*, the service wants its cyberspace operators to possess

²⁰ Kamal Jabbour, "Cyber Vision and Cyber Force Development" *Strategic Studies Quarterly*, Vol. 4, No. 1 (Spring 2010), 70.

²¹ Michelle Tan, "12 AFSCs to Comprise Cyber Career Path," *Air Force Times*, 29 March 2010, 19.

²² Cyberspace Badge Eligibility Criteria Message, as distributed as an attachment to a memorandum from General Norton A. Schwartz, Chief of Staff, United States Air Force, to All Major Command, Direct Reporting Unit, and Forward Operating Agency Commanders, Subject: Cyberspace Badge, 21 April 2010.

²³ Tan, "12 AFSCs to Comprise Cyber Career Path," 19.

fundamental competencies in a broad range of technologies while honing skills in a select few.²⁴ Although this document largely discusses enlisted specialization, it acknowledges the importance of technical degrees among officers despite the fact that “a breadth of knowledge and experience within cyberspace and across other domains is the desired end-state.”²⁵ While cyberspace professionals need to understand their domain, the roadmap’s breadth of knowledge desire runs counter to its need for specialization. At this point it is hard to surmise how specialized or generalized cyberspace operations officers will be, but if the initial training truly does provide a solid technical base that can be broadened over time with experience and additional training, the service should produce more knowledgeable officers better suited for cyberspace operations.

The Air Force also wants to train and educate its cyberspace officers throughout their careers. Air Force Space Command expects its officers to complete its new Cyber 100, 200, 300, and 400 courses as lieutenants, majors, lieutenant colonels, and colonels, respectively.²⁶ The major command has not finalized the content for these courses yet, but its recognition of the value of continued education and training is commendable.

The Air Force still has to overcome staffing challenges as it transforms and trains its new corps of cyberspace operations officers. Ironically, even as the service transforms the communications officer career field into a cyberspace corps, its need for traditional communications officers persists. Despite strong demand for communications services, the Air Force as a whole has shrunk steadily, leading to fewer officers in this career field as well.

²⁴ Air Force Roadmap for the Development of Cyberspace Professionals 2008-2018, 15 April 2008, 8

²⁵ Air Force Roadmap, 10.

²⁶ Michael Hoffman, “Cyber Command Takes Shape,” Air Force Times, 14 July 2008, 8.

Since the early 1990s the Air Force has experienced a number of force reductions. From 1992 to 1995, with no Cold War threat to sustain a larger military, the Air Force reduced its forces by 177,000 people.²⁷ In January 2004 Air Force Chief of Staff General John Jumper announced plans to cut 12,700 enlisted members and 3,900 officers by the end of 2005 in order to meet the service's authorized end strength of 369,700.²⁸ Then, under Chief of Staff General T. Michael Moseley, the Air Force adopted a plan to draw down to 316,500 active duty personnel in the hopes of using the saved personnel dollars to fund recapitalization and modernization efforts.²⁹ This was the infamous Program Budget Decision 720, or PBD 720, and it would have reduced the communications officer career field by about 1,200 people.³⁰

While the Air Force drew down following the end of the Cold War, other career fields ironically turned to a drawn down communications community to help them computerize and automate their workflows and processes to accommodate their new manning levels. Thus, while reductions increased demand for computer professionals, the remaining communications officers could not assume the additional workload because of the cuts they had endured. To make matters worse in this apparent catch-22 scenario, the Air Force had already eliminated the software engineering and computer programmer/analyst components of the career field. These officers might have been the ideal craftsmen to develop the computer tools and applications to help automate other career fields, but the Air Force had already dismissed these skills.

²⁷Beth J. Asch and John T. Warner, *An Examination of the Effects of Voluntary Separation on Incentives* (Santa Monica: Rand, 2001), 5-7.

²⁸Peter Grier, "The New Drawdown," *Air Force Magazine* 87, no. 3 (March 2004): 51.

²⁹ Erik Holmes, "Increase in Airmen Requires More Instructors," *Air Force Times*, 9 January 2009, http://www.airforcetimes.com/news/2009/01/airforce_plusup_010809 (accessed 24 March 2010).

³⁰ SAF/XCID PBD 720 Overview briefing, May 2006, Slide 6.

Then, in June 2009, Secretary of Defense Robert Gates unexpectedly ended the force reduction early and new Chief of Staff General Norton Schwartz announced the Air Force would instead grow to 332,700 active duty personnel by the end of fiscal 2010.³¹ It seemed as if turbulent times for manning were over, but that sensation was fleeting.

On 16 November 2009 the Air Force began yet another force reduction, this time in efforts to reduce the force by 1,633 enlisted members and 2,074 officers.³² The task proved to be difficult though, and on 25 March 2010 force management measures were expanded in order to “bring the service closer to its authorized funded end strength.”³³ Under this reduction a total of 308 communications—or cyberspace operations—officers, the largest number of any career field, are targeted for separation or retirement.³⁴ One can only wonder how these changes will impact the Air Force’s cyberspace force.

Conclusion

Early indications are that cyberspace operations officers will have to specialize, at least to an extent. Creating a new career field for cyberspace operations signals a cultural change, and a renewed focus on education and training emphasizes the need for specialization. Converting all communications officers wholesale to this new career field, however, could negate the importance of these changes.

As the Air Force charts its path forward in cyberspace, it should be wary of merely creating a new label for an old job. The service may have signaled such an empty gesture with the wholesale transfer of

³¹ Holmes, “Increase in Airmen Requires More Instructors.”

³² Daniel P. Elkins, “Officials Announce Fiscal 2010 Force Management Measures,” *Air Force Print News Today*, 16 November 2009, <http://www.af.mil/news/story.asp?id=123177979> (accessed 25 March 2010).

³³ Amaani Lyle, “Air Force Leaders Expand Force Management Options,” *Air Force Print News Today*, 25 March 2010, <http://www.af.mil/news/story.asp?id=123196695> (accessed 25 March 2010).

³⁴ Force Management Program Overview briefing, <http://www.acc.af.mil/> (accessed 25 March 2010), slide 16.

communications officers into the new cyberspace operations career field. It may yet distinguish this new career field as more than just a new label, but there is currently little evidence to suggest otherwise. As William Shakespeare so eloquently stated through the words of young Juliet Capulet:³⁵

O, be some other name!
What's in a name? that which we call a rose
By any other name would smell as sweet;
So Romeo would, were he not Romeo call'd,
Retain that dear perfection which he owes
Without that title. Romeo, doff thy name,
And for that name which is no part of thee

Or, to paraphrase, a communications officer by any other name is still a communications officer. Simply calling communications officers *cyberspace operations officers* will not make the domain specialists the Air Force needs. In time we will see if this is truly the end of the communications officer or merely a new name to be doffed at the next opportunity.

³⁵ William Shakespeare, *Romeo and Juliet*, Act 2, Scene 2.

Conclusions

Someday, perhaps in our time, the man holding my job will meet here with a staff of scientists, and they will wear no pilot's wings on their chests. That insignia will cease to be the yardstick of Air Force achievement.

General Henry "Hap" Arnold

The evolution of the Air Force communications officer parallels in many ways the evolution of the United States Air Force itself. Both can trace their earliest beginnings to the Army Signal Corps; the Air Force in lighter-than-air balloons used for reconnaissance, and communications officers using signal flags and torches to transmit messages. Both are inherently technology-based entities, and while both have had to grapple with advances in technology, the questions of centralized control versus unity of command, generalization versus specialization, and manning quantity versus quality have continued to be a challenge.

Communications officers became prominent in the Air Force because of the unique technical capabilities and skills they provided. That is no longer the case. Communications officers no longer provide the technical specialization that made them so prominent in the Air Force. Instead, communications officers have become generalists pursuing relevancy as managers and leaders instead of embracing the unique skill sets that made their career field so indispensable to the Air Force. Put simply, this generalization is bad, both for the Air Force and for communications officers.

The evolution of the communications officer can be broken down into four epochs. Although these periods have many similarities, there are general characteristics that illustrate their differences as well. The four epochs are that of the signal officer, the communications-electronics officer, the computer officer, and the cyberspace officer.

In analyzing these epochs, some of their differing characteristics are evident, including: timeframe and technological advances, for example. Other characteristics are remarkably similar: the importance of organizational structures, the prominence of leaders and their biases, and the effects of personnel perceptions.

Communications obviously hinge on technologies and techniques, but the early evolution of the communications officer is better attributed to the people and organizations of each epoch rather than the equipment or means that were employed. Organizationally, the infant Signal Corps was immeasurably shaped by, and remained dependent on, men like Albert J. Myer, Adolphus W. Greely, James Allen, and even Billy Mitchell.

Conversely, as the overall Air Force organizational structure has solidified, its development has relied less on individual people and more on sub-organizational structures. Air Force Communications Command, for example, owed its existence to Hap Arnold, Harold McClellan, and Ivan Farman, but the organization quickly took on a life of its own as it matured and became less reliant on specific individuals for its survival. It continued to expand its role and status until it reached its culmination point and met its demise at the hands of yet other institutionalized organizations—operational wings—within the Air Force.

At first glance the epoch of the computer officer appears to be the first era defined better by technology than by people or organizations, but only at a superficial level. Upon closer examination, it was really people—both senior leaders and technical officers—along with organizational changes—force reductions—that shaped career field mergers and officer generalization. The epoch of the cyberspace officer continues these trends with its focus on new organizations and force reductions.

This analysis purports that specific people are especially key in the embryonic stages of organizations and that specific individuals tend to become less crucial within more developed organizations. Any number of

people, for example, could have successfully led an established Signal Corps. Establishing the Signal Corps, however, took the right person under the right conditions, and if that person and those conditions did not exist, the signal officer may never have come to exist either.

The signal officer gained prominence during the American Civil War. While armies have used messengers and couriers throughout history, this conflict marked the beginning of a professional military communications service dedicated to transferring command instructions and providing situational awareness. The Signal Corps was a centralized organization that provided standardized training, equipment, procedures, and techniques to dispersed communicators throughout the Army.

Starting with a single signal officer, the Signal Corps grew and developed first flag and torch-based signaling procedures, and then expanded to include electric telegraph capabilities. These early communications specialists became more generalized as they expanded their role to meet requirements for reconnaissance, electrical and lighting engineering, and weather forecasting.

The Army restructured and reoriented its expanding Signal Corps to accommodate military personnel force reductions during interwar periods. At one point the corps provided more weather than communications services, but it eventually divested its weather responsibilities to focus on its military mission: communications. This timely reorientation let the corps engage in two newly developing and immensely influential technologies: electronics and the airplane.

In the early 1900s the signal officer became the communications-electronics officer. While the electric telegraph, telephone, and radio already existed at the turn of the century, it was in 1910 that Benjamin Foulois first successfully established wireless radio communications

between the ground and an airplane in flight.¹ This forever bonded air forces and communications.

Visionaries integrated flight and communications as an initial step in building the future of an emerging combat arm. While early pilots distrusted radio equipment and preferred to fly without it, Hap Arnold did much to institute communications as part of the future Air Force when he assigned Harold McClelland as his communications officer for his famous Washington, DC to Alaska flight. Arnold attributed much of the safe success of his mission to effective communications, and he therefore took steps to establish a centralized communications service for the Army Air Corps. So critical to air operations was this communications service that when the matured Army Air Corps eventually became the fledgling United States Air Force, the communications service was transferred from the Army to the new service as well.

While the communications officer's roots stem from operational requirements and the air service's inception, the genesis of the computer officer differs considerably. Centralized under the Air Force Comptroller, computer officers evolved from specialists who understood statistical services and accounting machines. These specialists became data automation and computer officers as the Air Force employed more and more computers. In 1985 the Air Force merged its communications and computer officers, and while it sought great efficiencies to deal with personnel shortages, it created a more generalized career field.

Another merger in 1996 combined communications officers with information management officers and visual information officers. Continuing the trend of creating interchangeable generalized officers with little specialized technical experience, this new breed of communications

¹ Benjamin D. Foulois and Carroll V. Glines, *From the Wright Brothers to the Astronauts: The Memoirs of Benjamin D. Foulois* (New York: McGraw-Hill, 1968), 71-73.

officer focused on broad leadership experiences and not technical expertise.

Meanwhile, the Air Force relegated its Air Force Communications Command to an impotent field operating agency and transferred communications personnel and equipment to operational mission commanders. Although the command had effectively centralized control and management that standardized systems across the service, the Air Force found its approach unresponsive to the warfighter as communications squadrons attempted to serve both functional and local masters. Putting communications squadrons squarely under the local wing commander was meant to eliminate this lack of responsiveness and improve base-level unity of command.

The communications officer next evolved into a cyberspace operations officer as the Air Force transformed support officers into warfighters themselves. When the Air Force changed its mission statement in 2005 to include cyberspace as a warfighting domain, the focus of its communications officers also changed. While communications officers officially become cyberspace operations officers on 30 April 2010, the Air Force is still struggling to define their identity.

This new career field is currently divided into two sub-specialties. Most experienced communications officers were merely rebranded into the cyber control shredout. A few, however, will focus on the cyber warfare aspects of cyberspace. While these changes by themselves seem mostly cosmetic, the use of the new 17DX Air Force Specialty Code may be more significant. This change alludes to the fact that cyberspace is an operational mission rather than a support mission.

Many conclusions and implications can be drawn from studying the evolution of the Air Force communications officer from his earliest days as a signal officer to today's cyberspace operations officer. The first and foremost conclusion finds that the ancestors of today's cyberspace operations officer were most successful when harnessing new skills and

technologies as specialists. Whether devising flag signaling techniques, mobilizing telegraph wagons, establishing aerial radio capabilities, or computerizing statistical and financial functions, it was through dedicated expertise in their technical skills that communications specialists achieved relevance—or even prominence.

Successful communications organizations must adapt as technology advances and as communications requirements change. Early communications leaders like Albert J. Myer and Harold McClellan created new organizations to provide specialized capabilities, but successive leaders transformed their organizations to meet contemporary needs for weather, air, and computer services.

In each case, however, changes were made incrementally and by drawing new functions and specialties into the existing framework, not by displacing the old with the new. The telegraph, for example, could have been seen as making signal flags immediately obsolete, but the signal corps realized the importance of a broad spectrum of signaling techniques and refrained from becoming a simple telegraph corps. Later communications specialists likewise refused to establish themselves based *only* on radio, radar, telephone, or computer technologies. No single communications method defined the communications officer. Communications encompassed all of these and more, and officers were called on to specialize in each.

It was in choosing to no longer specialize in communications that communications officers failed the Air Force. In focusing instead on broad-based managerial and leadership skills, the communications officer became just an interchangeable generalist officer. A communications officer without technical skills serves very little purpose.

Now, as if seeing the error of its ways, the communications officer career field has turned a sharp corner and is seemingly pursuing specialization in cyberspace operations. The Air Force's pursuit of cyberspace technical expertise is reminiscent of previous

communications successes, but there are also implications that both the communications community and the Air Force as a whole should consider.

Most importantly, there is the danger that the Air Force is pushing so hard to specialize in cyberspace that it is ignoring, or even displacing, many other aspects of the overall communications mission. Unlike the telegraph, radio, or computer, cyberspace appears to be taking hold not as an additional focus of communications, but as the *only* focus. Over time communications methods and technologies can certainly become obsolete. Carrier pigeons and telegraph wagons, for example, became unnecessary, but only after newer technologies provided the same or enhanced capabilities. Can the same be said about cyberspace when comparing it to other forms of communications?

On the contrary, cyberspace has not replaced radios, telephones, or computers at all. The move to reengineer the Air Force communications officer as a cyberspace operations officer clearly depicts all communications as parts of cyberspace, but just the opposite is true. Cyberspace is part of overall communications, but not all communications fit under a cyberspace umbrella. Postal services, administrative support, and radar maintenance, for example, are clearly not cyberspace functions though they are part of the communications realm.

Formation of the cyberspace operations career field in place of communications officers also has organizational implications that the Air Force should consider. The service may want to reconsider what it calls communications squadrons and where these squadrons fit into the base wing structure. Communications squadrons currently belong to mission support groups, but if the communications mission has become cyberspace operations, perhaps these squadrons belong in operations groups. If, however, the communications squadron is unchanged the communications community primarily provides the same

communications services as before, then the career field name change means little in the day-to-day life of most communications officers and is simply a relabeling with little significance.

The Air Force is clearly emphasizing cyberspace specialization, and this transformation has the potential to restore the communications officer to technical prominence, but the service has failed to address the other aspects of the communications mission making it difficult to discern the career field's future. The Air Force eliminated the communications officer, resurrecting it instead as the *cyberspace operations officer*. Is this yet another forced label that will be largely ignored by the real world just as the *communications-computer systems officer* and *communications and information officer* labels were? Regardless of official titles, these officers were communications officers. The title *communications officer* may have officially gone away on 30 April 2010, but if history is any indication, communications officers will be around for a very long time.

Bibliography

Academic Papers

Laird, Orville. "A Career for Communications and Electronics Officers in the USAF." Maxwell AFB: Air War College, March 1950.

Articles

"24th Air Force Activated, 2 Units Realign in Joint Ceremony," 18 August 2009.
<http://www.af.mil/news/story.asp?id=123163831> (accessed 18 March 2010).

Air Force Officer Opportunities.

<http://www.airforce.com/opportunities/officer/careers/> (accessed 25 March 2010).

Arquilla, John and David Ronfeldt. "Cyberwar is Coming!" *Comparative Strategy* 12, no. 2 (April-June 1993): 141-165.

Elkins, Daniel P. "Officials Announce Fiscal 2010 Force Management Measures," *Air Force Print News Today*, 16 November 2009.

<http://www.af.mil/news/story.asp?id=123177979> (accessed 25 March 2010).

Friedrich, Otto. "Machine of the Year: The Computer Moves In." *Time* 121, no. 1 (3 January 1983): 14-24.

Gettle, Mitch. "Air Force Releases New Mission Statement." *Air Force Print News*, 8 December 2005.

<http://www.af.mil/news/story.asp?storyID=123013440> (accessed 18 March 2010).

Grier, Peter. "The New Drawdown." *Air Force Magazine* 87, no. 3 (March 2004): 50-53.

"Heroes: Lindbergh." *Time* 11, no. 1 (2 January 1928).

<http://www.time.com/time/magazine/0,9263,7601280102,00.html> (accessed 15 May 2010).

Hoffman, Michael. "Cyber Command Takes Shape," *Air Force Times*, 14 July 2008, 8.

Holmes, Erik. "Increase in Airmen Requires More Instructors," *Air Force Times Online*, 9 January 2009.

http://www.airforcetimes.com/news/2009/01/airforce_plusup_010809/ (accessed 24 March 2010).

Jabbour, Kamal. "Cyber Vision and Cyber Force Development." *Strategic Studies Quarterly*, Vol. 4, No. 1 (Spring 2010), 63-73.

Jones, Louis B., "Three Decades of Air Force Communications." *Airpower Historian* 10, no. 2 (April 1963): 57-60.

Lyle, Amaani. "Air Force Leaders Expand Force Management Options," *Air Force Print News Today*, 25 March 2010,

<http://www.af.mil/news/story.asp?id=123196695> (accessed 25 March 2010).

- Rolfesen, Bruce. "Drawdown: Force to be Cut by 6,000 Airmen." *Air Force Times*, 5 April 2010, 20-21.
- Tan, Michelle. "12 AFSCs to Comprise Cyber Career Path." *Air Force Times*, 29 March 2010, 19.
- Taylor, J. Francis. "The Vanishing Communicator." *Signal*, May 1965, 80-83.
- Thompson, George Raynor. "Civil War Signals, Part 2." *Signal*, May-Jun 1954, 30-77.

Books

- Arnold, Henry H. and Ira Eaker. *Army*. New York: Harper & Brothers, 1942.
- Arnold, Henry H. and Ira Eaker. *Winged Warfare*. New York: Harper & Brothers, 1941.
- Asch, Beth J. and John T. Warner. *An Examination of the Effects of Voluntary Separation on Incentives*. Santa Monica: Rand, 2001.
- Baumgardner, Randy, Ed. *AACS Alumni Association: 1938-2004*. Paducah, KY: Turner, 2004.
- Berg, A. Scott. *Lindbergh*. New York: Putnam, 1998.
- Catholic Youth Bible. New Revised Standard Version. Winona, MN: Saint Mary's Press, 2000.
- Ceruzzi, Paul E. *A History of Modern Computing*. Cambridge: MIT Press, 1998.
- Denny, Mark. *Blip, Ping & Buzz: Making Sense of Radar and Sonar*. Baltimore: Johns Hopkins University Press, 2007.
- Drezner, S.M., *The Computer Resources Management Study*. Santa Monica: Rand, 1976.
- Foulois, Benjamin D. and Carroll V. Glines. *From the Wright Brothers to the Astronauts: The Memoirs of Benjamin D. Foulois*. New York: McGraw-Hill, 1968.
- Freiberger, Paul, and Michael Swaine. *Fire in the Valley: The Making of the Personal Computer*. 2nd ed. New York: McGraw-Hill, 2000.
- Galway, Lionel A., *Understrength Air Force Officer Career Fields: A Force Management Approach*. Santa Monica: Rand, 2005.
- Gibson, William. *Neuromancer*. New York: Ace Books, 1984.
- Greely, Adolphus W. *Reminiscences of Adventure and Service: A Record of Sixty-Five Years*. New York: C. Scribner's Sons, 1927.
- Historical Sketch of the Signal Corps (1860-1941)*, Pamphlet No. 32. Fort Monmouth, NJ: Eastern Signal School, 1942.
- Howeth, Linwood S. *History of Communications-Electronics in the United States Navy*. Washington DC: Bureau of Ships and Office of Naval History, 1963.
- Hurley, Alfred F. *Billy Mitchell: Crusader for Air Power*. New York: F. Watts, 1964.
- Levy, Dina G., Harry J. Thie, Albert A. Robbert, Scott Naftel, Charles Cannon, Rudolph H. Ehrenberg, Matthew Gershwin. *Characterizing the Future Defense Workforce*. Santa Monica: Rand, 2001.
- Marshall, Max L. *The Story of the U.S. Army Signal Corps*. New York: F. Watts, 1965.

- McCullough, David G. *Truman*. New York: Simon and Schuster, 1992.
- McPherson, James M. *Battle Cry of Freedom: The Civil War Era*. New York: Oxford University Press, 1988.
- Mitchell, William. *Field Signal Communications (Second Lecture)*. Fort Leavenworth: Infantry and Cavalry School, Department of Military Art, Signal Corps, May 1905.
- Mitchell, William. *General Greely: The Story of a Great American*. New York: G.P. Putnam's Sons, 1936.
- Mitchell, William. *The Opening of Alaska*. Anchorage, Alaska: Cook Inlet Historical Society, 1982.
- Mitchell, William. "William Mitchell Papers." Air University Library Microfilm 629.13 M682mw (m.f.), 1923.
- Mitchell, Vance O. *Air Force Officers: Personnel Policy Development, 1944-1974*. Washington DC: Air Force History and Museums Program, 1996.
- Morrison, Larry R. *From Flares to Satellites: A Brief History of Air Force Communications*. Scott AFB, IL: Air Force Communications Agency Office of History, 1997.
- Nalty, Bernard C. *Winged Shield, Winged Sword: A History of the United States Air Force, Vol. 1*. Washington DC: Air Force History and Museums Program, 1997.
- Nalty, Bernard C. *Winged Shield, Winged Sword: A History of the United States Air Force, Vol. 2*. Washington DC: Air Force History and Museums Program, 1997.
- Perret, Geoffrey. *Winged Victory: The Army Air Forces in World War II*. New York: Random House, 1993.
- Raines, Rebecca Robbins. *Getting the Message Through: A Branch History of the U.S. Army Signal Corps*. Honolulu: University Press of the Pacific, 2005.
- Report of the Secretary of War to the President, November 15, 1890 compiled in *Annual Report of the Secretary of War, 1890-1891*. Washington: Government Printing Office.
- Richardson, James D., ed. *A Compilation of the Messages and Papers of the Presidents*. Vol. 10. New York: Bureau of National Literature, 1916.
- Richardson, James D., ed. *A Compilation of the Messages and Papers of the Presidents*. Vol. 12. New York: Bureau of National Literature, 1916.
- Shores, Louis. *Highways in the Sky: The Story of AACS*. New York: Barnes and Noble, 1947.
- Snyder, Thomas S. *Air Force Communications Command, 1938-1986: An Illustrated History*. Scott Air Force Base, IL: Air Force Communications Command Office of History, 1986.
- Snyder, Thomas S. *Air Force Communications Command, 1938-1991: An Illustrated History*. Scott Air Force Base, IL: Air Force Communications Command Office of History, 1991.
- Spires, David N. *Beyond Horizons: A Half Century of Air Force Space Leadership*. Rev. ed. Washington DC: Air Force Space Command and Air University Press, 1998.

- Sterling, Christopher H. *Military Communications: From Ancient Times to the 21st Century*. Santa Barbara, CA: ABC-CLIO, 2008.
- Terrett, Dulany. *The Signal Corps: The Emergency (to December 1941)*. Washington DC: Office of the Chief of Military History, 1956.
- Van Creveld, Martin. *Command in War*. Cambridge: Harvard University Press, 1985.
- Waugh, John C. *The Class of 1846: From West Point to Appomattox: Stonewall Jackson, George McClellan, and Their Brothers*. New York: Warner Books, 1994.
- Weigley, Russell F. *A Great Civil War: A Military and Political History, 1861-1865*. Bloomington: Indiana University Press, 2000.
- Wolk, Herman S. *Planning and Organizing the Postwar Air Force, 1943-1947*. Washington DC: Office of Air Force History, 1982.
- Woods, David L. *A History of Tactical Communication Techniques*. Orlando: Martin, 1965.

Government Documents

- 1908th Communications Squadron Official History*, Air Force Historical Research Agency Call No. K381.2133 V.14 1 January - 31 December 1984.
- 1908th Communications Squadron Official History*, 1 January - 30 September 1990, Air Force Historical Research Agency Call No. K383.01-1908, January-December 1990.
- Air Force Biography, "Brigadier General Ivan Lonsdale Farman."
<http://www.af.mil/information/bios/bio.asp?biolD=5389> (accessed 24 February 2010).
- Air Force Biography, "Harold Mark McClelland."
<http://www.af.mil/information/bios/bio.asp?biolD=6355> (accessed 24 February 2010).
- Air Force Officer Classification Directory*, 31 January 2008.
- Air Force Officer Classification Directory*, 30 April 2010.
- Air Force Materiel Command (AFMC) Communications-Computer Systems Officer (33SX AFSC) Visual Information Officer (33VX AFSC) Career Development Plan (CDP)*, 1 October 1994.
- Air Force Manual 36-1. *Officer Personnel: Officer Classification Manual*, 1 September 1955.
- Air Force Manual 36-1. *Officer Personnel: Officer Classification Manual*, 30 June 1960.
- Air Force Manual 36-1, *Officer Personnel, Officer Classification Manual*, 15 April 1963, with changes applied through Change 36-1V, 6 November 1968.
- Air Force Manual 36-1. *Officer Personnel: Officers' Classification Manual*, 1 January 1952.
- Air Force Manual 36-2105, *Personnel: Officer Classification*, 31 October 1995.
- Air Force Manual 36-2105, *Personnel: Officer Classification*, 31 October 1998.
- Air Force Recurring Publication 36-1, *Air Force Officers' Career Newsletter*, Vol. 3, No. 4, July-August 1970.

Air Force Recurring Publication 36-1, *Officers' Career Newsletter*, Vol. 18, No. 3, Summer 1985.

Air Force Regulation 36-1, *Officer Personnel: Officer Classification Regulation*, 1 March 1977, with changes applied through Change 14, 15 September 1983.

Air Force Regulation 36-1, *Officer Personnel: Officer Classification*, 1 January 1984, with changes applied through Change 10, 15 September 1988.

Air Force Roadmap for the Development of Cyberspace Professionals 2008-2018, 15 April 2008.

Air Force Standards Agency Fact Sheet, Air Force Historical Research Agency, <http://www.afhra.af.mil/factsheets/factsheet.asp?id=14010> (accessed 14 March 2010).

Air Force Study of Air Force Organizational Ability to Exploit and Manage Computer Technology, 1970. Air University Library 358.61 U581a.

Air Staff Chief Communicators Fact Sheet, Air Force Network Integration Center, <http://www.afnic.af.mil/library/history/index.asp> (accessed 14 March 2010).

Air Staff Datamators Fact Sheet, Air Force Network Integration Center, <http://www.afnic.af.mil/library/history/index.asp> (accessed 14 March 2010).

Army Air Forces Historical Studies No. 25. *Organization of Military Aeronautics, 1907-1935 (Congressional and War Department Action)*. Historical Division, Assistant Chief of Air Staff, Intelligence, December 1944, Fairchild Documents M-U 27218 no.25 and www.afhra.af.mil/shared/media/document/AFD-090602-051.pdf (accessed 18 February 2010).

Army Air Forces Manual 35-0-1, *Military Personnel Classification and Duty Assignment*, 1 July 1945.

Communications and Information Career Field Officer Professional Development Guide, undated but distributed by AFPC on behalf of Air Staff on 23 Jul 1999.

Force Management Program Overview briefing, <http://www.acc.af.mil/> (accessed 25 March 2010).

History of the Air Force Command, Control, Communications, and Computer Agency, 1 January 1994 - 31 December 1995, Air Force Historical Research Agency Call No. K380.01 V.6 January 1994-December 1995.

History of the Air Force Command, Control, Communications, and Computer Agency, 1 January 1994 - 31 December 1995, Air Force Historical Research Agency Call No. K380.01 V.7 January 1994-December 1995.

History of the Air Force Communications Command, 1 January – 31 December 1984, Vol. 1, Air Force Historical Research Agency Call No. K380.01 V.1, January-December 1984, 51.

History of the Air Force Communications Command, 1 January – 31 December 1986, Vol. 1, Air Force Historical Research Agency Call No. K380.01 V.1.

History of the Assistant for Personnel Systems, 1 July 1962 - 30 June 1963, Vol. 5, Air Force Historical Research Agency Call No. K141.01 V.5.

Joint Publication 1-02, *Department of Defense Dictionary of Military and Associated Terms*, 12 April 2001 as amended through 31 October 2009.

SAF/XCID PBD 720 Overview briefing, May 2006.

Tactical Air Command Special Order GB-45, 27 September 1990, available in 1908th Communications Squadron Official History, 1 January - 30 September 1990, Air Force Historical Research Agency Call No. K383.01-1908 Jan-Dec 1990, no page number.

Trechter, Lieutenant Colonel Joseph. "Bullet Background Paper on AFSC Conversion Process." 6 January 10.

E-Mails/Forum Posts/Messages

Lord, Lieutenant General William T. Chief of Warfighting Integration and Chief Information Officer, United States Air Force. To major command vice commanders and others. E-mail. Subject: Accelerating Conversion from 33S to 17D, 27 January 2010.

Message. 251830Z JUN 84, KSA/3097. Headquarters Tactical Communications Division. To 1913th Communications Group, Subject: Communications and Data Merger, 25 June 1984.

Sovada, Lieutenant Colonel C.J. "30 April 2010 AFSC Conversion," 33S / 17D Community of Practice post, 1 February 2010, <https://www.my.af.mil/afknprod/Forum/default.aspx?g=posts&t=96261&Filter=AF-SC-01-25> (accessed 16 April 2010).

Sovada, Lieutenant Colonel C.J. "When will our AFSC change?" 33S / 17D Community of Practice post, 24 September 2009, <https://www.my.af.mil/afknprod/Forum/default.aspx?g=posts&t=80181&Filter=AF-SC-01-25> (accessed 16 April 2010).

Memorandums

Bohn, Brigadier General Bruce J., Commander, Tactical Communications Division. To 1908th Communications Squadron Commander, Subject: Communications-Computer Systems Restructure Memorandum, 27 September 1990, available in 1908th Communications Squadron Official History, 1 January - 30 September 1990, Air Force Historical Research Agency Call No. K383.01-1908, January-December 1990, 40.

Bohn, Brigadier General Bruce J., Deputy Chief of Staff for Communications-Computer Systems, Tactical Air Command. To 23d Tactical Fighter Wing Commander, Subject: Communications-Computer Systems Restructure Memorandum, 17 September 1990, available in 1908th Communications Squadron Official History, 1 January - 30 September 1990, Air Force Historical Research Agency Call No. K383.01-1908, January-December 1990, 39.

LeMay, General Curtis E., Vice Chief of Staff, United States Air Force. To listed commands. Subject: Focal Point for Data Automation, 5 June 1961, available in *An Air Force Study of Air Force Organizational Ability to Exploit and Manage Computer Technology*, 1970, Appendix 1. Air University Library 358.61 U581a.

Nicholas, Colonel James G., Vice Commander, Air Force Command, Control, Communications, and Computer Agency. To Major Vaughn, HQ USAF/SCX, Subject: Organizational Review of Command, Control, Computers, and Communications (SC) and Information Management (IM) Memorandum, 10 January 1994, available in *History of the Air Force Command, Control, Communications, and Computer Agency*, 1 January 1994 - 31 December 1995, Air Force Historical Research Agency Call No. K380.01 V.6, January 1994-December 1995, I-186-1.

Schwartz, General Norton A., Chief of Staff, United States Air Force. To All Major Command, Direct Reporting Unit, and Forward Operating Agency Commanders. Subject: Cyberspace Badge, 21 April 2010, with Cyberspace Badge Eligibility Criteria Message as attachment.

Welch, General Larry D., Chief of Staff, United States Air Force. To All Major Command and Separate Operating Agency Commanders. Subject: Air Force Communications and Computer Restructure Memorandum, 18 June 1990, available in *History of the Air Force Communications Command*, 1 January - 31 December 1990, Vol. 2, Air Force Historical Research Agency Call No. K380.01 V.1 January-December 1990, I-2-1.